A DELPHI STUDY TO DEVELOP A STANDARD LIST OF ACTIVITIES THAT COMPRISE ROUTINE CLINICAL PHARMACY SERVICES

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A wealth of literature exists quantifying the benefits of clinical pharmacist optimization of a patient's medication therapy, but little literature exists codifying a model of clinical practice that allows for standardization and efficient staffing analysis. Essentially, the range of clinical pharmacy services is well described; however, the activities that comprise these services are not well documented. The purpose of this thesis was to develop a list of activities that comprise routine clinical pharmacy services for all inpatients in the military health system. Utilizing the Delphi method, an expert panel of six senior Army Pharmacy officers and civilians participated in a four round survey including one semi-structured interview and three successive rounds of Likert surveys. Panelist interview responses were reviewed for consistent themes, and their survey responses were analyzed for inter-round stability utilizing nonparametric statistics. A resultant list of fifteen clinical pharmacy activities reached the predetermined standard of consensus for inclusion in the list of activities that comprise routine clinical pharmacy services. These results were discussed in terms of their reliability and generalizability along with their implications for the development of future staffing models. Opportunities for future research building on the results of this study were suggested.

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The opinions and conclusions expressed herein are those of the student author and do not necessarily represent the views of the U.S. Army Command and General Staff College or any other governmental agency. (References to this study should include the foregoing statement.)

ABSTRACT

A DELPHI STUDY TO DEVELOP A STANDARD LIST OF ACTIVITIES THAT COMPRISE ROUTINE CLINICAL PHARMACY SERVICES, by Major Christopher W. Ellison, 103 pages.

A wealth of literature exists quantifying the benefits of clinical pharmacist optimization of a patient's medication therapy, but little literature exists codifying a model of clinical practice that allows for standardization and efficient staffing analysis. Essentially, the range of clinical pharmacy services is well described; however, the activities that comprise these services are not well documented. The purpose of this thesis was to develop a list of activities that comprise routine clinical pharmacy services for all inpatients in the military health system. Utilizing the Delphi method, an expert panel of six senior Army Pharmacy officers and civilians participated in a four round survey including one semi-structured interview and three successive rounds of Likert surveys. Panelist interview responses were reviewed for consistent themes, and their survey responses were analyzed for inter-round stability utilizing nonparametric statistics. A resultant list of fifteen clinical pharmacy activities reached the predetermined standard of consensus for inclusion in the list of activities that comprise routine clinical pharmacy services. These results were discussed in terms of their reliability and generalizability along with their implications for the development of future staffing models. Opportunities for future research building on the results of this study were suggested.

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ACRONYMS

APhA	American Pharmacists Association
ASAM	Automated Staffing Assessment Model
ASHP	American Society of Health-System Pharmacy
CPS	Clinical Pharmacy Services
FTE	Full Time Equivalent
MHS	Military Healthcare System
PCU	Pharmacy Care Unit
Pharm.D.	Doctor of Pharmacy
SGA	Small Group Advisor

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CHAPTER 1

INTRODUCTION

> They dream of health care that is safe, timely, effective, efficient, equitable, and patient centered. The professions have promised to provide that, and now the people seem to be demanding that we keep our promise.
>
> —Charles D. Hepler, *A Dream Deferred*

Background and Context

Although clinical pharmacy concepts have existed since the 1960s, the transition from theory to practice and incorporation into mainstream pharmacy practice has only occurred over the past twenty-five years.[1] In 1989, Hepler and Strand codified the clinical practice model with their landmark article, "Opportunities and Responsibilities in Pharmaceutical Care." Developing the term pharmaceutical care, which encompassed the provision of rational drug therapy for an array of disease states, Hepler and Strand defined distinct practice areas and responsibilities for pharmacists.[2] Though this concept and its associated mandates for the profession provided a vision for the establishment of pharmaceutical care and clinical pharmacy into the conventional healthcare system, it only loosely defined the mechanisms necessary to incorporate the concept into pharmacists' daily work. While the members of the profession were interested and motivated to provide this care, there was a fundamental lack of direction associated with its evolution.[3]

While establishing pharmaceutical care over the last two-plus decades, the profession branched out into various practice settings and performed a variety of patient care functions. This made the standardization of the practice model all but impossible

because the construction of any given practice was based on the "societal needs for pharmacy services" rather than the impetus of the profession.[4] While a complicating factor discussed later in this study, this was an important step in creating a solid foundation for pharmaceutical care because the profession was in the process of defining its new role in the healthcare system. Rather than establishing a standard model and forcing it on the system, the focus of the profession was on establishing the effectiveness of pharmaceutical care and determining the areas where this concept would have the most profound impact. Toward that effort, members of the profession constructed proof-of-concept models and designed studies with the intent of showing that the provision of pharmaceutical care by clinical pharmacists is effective at reducing healthcare costs associated with various types of illness. Appropriately, a wealth of literature exists that quantifies the societal and personal economic benefit subsequent to clinical pharmacy optimization of a patient's medication therapy.[5]

Two important consequences arose from this period of development and establishment. First, the profession established that the concept of pharmacy care was effective at improving patient outcomes and decreasing healthcare costs. The median benefit-to-cost ratios associated with the implementation of pharmaceutical care programs shows a savings of four dollars and eighty-one cents on gross healthcare costs for every dollar spent on clinical pharmacy services (CPS). These ratios range from a savings of one dollar to as high as thirty-five dollars in savings for every dollar spent. Incidentally, these savings were not simply due to reductions in drug costs, but due to an overall reduction in the cost of healthcare for those patients receiving pharmaceutical care indicating a potential improvement in outcomes.[6] This data is important because it

establishes that even in the worst case investment in clinical pharmacy results in an even return on investment regardless of the practice-setting, and in the best case it could profoundly impact healthcare cost through its positive impact on patients' health. In part it was this dramatic effectiveness that led to guarded wide-spread acceptance of the new clinical role of pharmacists within healthcare.

In the larger schema, the second and probably the most important consequence of the rush to prove effectiveness, is that the profession has grown in many different directions. Practice settings for the provision of pharmaceutical care range from ambulatory immunization clinics at the neighborhood pharmacy to participation in medication therapy management as part of a rounding team working on critically ill patients. By the very nature of these diverse practice environments, it becomes very difficult to standardize the provision of pharmaceutical care.[7] Thus, the overarching problem is that the profession of pharmacy had noble professional goals without a standardized and universally accepted plan to measure efficiency. Hepler and Strand described one key to marketing the concept of pharmaceutical care was to establish the overlap between clinical effectiveness and cost effectiveness for healthcare, but they, along with the rest of the profession, seemingly ignored the next logical foundational item: a standard for determining the overall efficiency of the programs.[8]

The workload assessment model used to determine staffing requirements for pharmacies within the Military Healthcare System (MHS), the Automated Staffing Assessment Model (ASAM), relies almost solely on dispensing related functions.[9] This model only considers traditional measures of pharmacy workload such as the number of prescriptions dispensed or sterile intravenous products prepared, which are captured via

the Medical Expense Reporting System. For clinical pharmacists it provides a fixed number of personnel based on the size of the organization. Consequently, in an era of economic constraints where organizations must regularly demonstrate efficiency, various departments of pharmacy have developed unique methods to evaluate the effectiveness of their clinical pharmacists.[10] Unfortunately, these independent assessments lack the strength of a consistent, unified, enterprise-wide metric that can be captured by our clinical information systems.

Understanding that pharmaceutical care is not a "standard commodity," was established with Hepler and Strand; however, they also recognized that the "fundamental goals, processes, and relationships of pharmaceutical care . . . exist independent of the practice setting, although the specific content of the standards may vary from setting to setting."[11] This provides hope that a standard set of evaluation criteria could be applied for the purpose of determining optimum staffing ratios for the practice of clinical pharmacy.

Problem Statement

The current system used to determine clinical pharmacist staffing levels in the MHS does not consider enough information to accurately determine clinical pharmacy staffing requirements. Throughout the various transitions from conceptualization, framework development, proof of concept, to the current model where the provision of pharmacy care is a commonplace aspect of patient care, the contributions of clinical pharmacy practice have established the provision of CPS as a valuable feature of the healthcare system. Consequently, the acceptance of this new practice model has established a solid foundation in civilian healthcare. The military has embraced the utility

of clinical pharmacy's optimization of patient's medication therapy as evidenced by the integration of the clinical pharmacist throughout the MHS. However, as in the civilian sector, the military practice setting and consequently the available clinical pharmacy workload and staffing systems have not kept pace with the dynamics in the field.

Research Question

The research question is: Which activities routinely performed by clinical pharmacists in the MHS should be included in a standardized list of clinical pharmacy services that should be provided to all inpatients?

Assumptions

The major assumption associated with this paper is that the information systems currently in use within the MHS will not be replaced in the foreseeable future. This assumption is important because it prevents speculation on the data-capturing capabilities of future automation or information systems. Instead, it will serve as a forcing function for either the development of staffing metrics that adapt to the currently available information systems or the identification of necessary capabilities for future systems.

Scope

This study will only address the provision of pharmaceutical care through the practice of clinical pharmacy for inpatients rather than include all available clinical pharmacy practice settings. By its nature clinical pharmacy performed in a hospital is more nebulous, including job functions that are more difficult to quantify or document such as interventions made on medication ordering during rounding with a multi-disciplinary healthcare team, pharmacokinetic dose adjustments, medication histories,

discharge counseling, etc. The exclusion of studying activities that are solely appropriate for evaluating pharmaceutical care in ambulatory clinics or in the health-system based or community based outpatient pharmacy setting narrow the focus and creates an appropriate foundation for this practice setting alone. Further, this study will only address only the provision of CPS in Army medical treatment facilities of the MHS. Although its results may be generalizable to other branches of the MHS, this study will develop conclusions and recommendations specifically for Army pharmacies.

Definitions

The following are key term definitions that are fundamental to this study. These terms will appear throughout this document and are essential to answering the research question. These key terms along with other less common vernacular are listed in the glossary.

Automated Staffing Assessment Model: The Army Medical Command's Manpower HQDA-approved manpower requirements determination process.[12]

Clinical Pharmacy: A health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, wellness, and disease prevention.[13]

Medication History: An interview with the patient/care-giver, reviewing documentation such as previous medicine orders, referral letters, admission notes, and patient medicine lists.[14]

Medication Reconciliation: The process of comparing a patient's medication orders to all of the medications that the patient has been taking. This reconciliation is done to avoid medication errors such as omissions, duplications, dosing errors, or drug

interactions. It should be done at every transition of care in which new medications are ordered or existing orders are rewritten.[15]

Pharmacokinetic monitoring: The process of applying pharmacokinetic principles, absorption, distribution, metabolism, and excretion of drugs, to determine the dosage regimens of specific drug products for specific patients to maximize pharmacotherapeutic effects and minimize toxic effects.[16]

Pharmaceutical (Pharmacy) Care: The responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life. These outcomes are (1) cure of a disease; (2) elimination or reduction of a patient's symptomatology; (3) arresting or slowing of a disease process; or (4) preventing a disease or symptomatology.[17]

Therapeutic Drug Monitoring: Interpretation, monitoring, and communication of measured drug concentrations in body fluids to optimize drug efficacy and minimize toxicity.[18]

Limitations

There are two major limitations to this study. First, the literature is limited with regard to availability of published clinical pharmacy staffing models. Because there are no universally accepted standards of clinical pharmacy practice, there are no universally applicable staffing models described in the literature to determine ideal staffing ratios. Consequently, this study will seek to determine what CPS activities should be included in the future MHS model for clinical pharmacist staffing rather than comparing available models built around established standards. Second, the availability of descriptive historical documentation for the development of the current Army staffing model is

lacking. Fundamental understanding of the rationale for the current staffing systems is critical to identifying and comparing their viability with other available systems. To the greatest extent possible, this effect will be mitigated through interviews with subject matter experts in the MHS.

Delimitations

This study will only consider materials available prior to October 2011. As this study is completed, the American Society of Health-System Pharmacy (ASHP) - Pharmacy Practice Model Initiative is currently on-going with the stated goal of identifying "core patient-care-related services that should be consistently provided by departments of pharmacy in hospitals and health systems."[19] It is expected that programs and studies associated with this initiative will produce proposals for universal practice models subject to ratification by pharmacy professional organizations. Additionally, this project could potentially produce strategies to quantify those universal functions associated with pharmaceutical care. These findings are potentially important to the conclusions of this study; however, at the time of initiation of this research these were still outstanding problems for the MHS and the profession writ large.

Significance

Identifying a universal list of CPS activities for clinical pharmacists to perform on all patients within the MHS is the critical first step to developing an accurate MHS clinical pharmacist staffing model. The development of a valid MHS staffing model will provide a valuable tool for leaders to accurately determine the appropriate ratios of clinical pharmacists within MHS healthcare centers. Additionally, these core CPS

functions will serve as a foundation for effective evaluation of CPS activities within and comparisons across the MHS, thus enabling administrators to quantify the contributions of clinical pharmacists within their organization. Overall, the development of a core set of clinical pharmacist job functions will contribute to greater efficiency within the MHS. In an era of looming budget constraints, such efficiencies will prove paramount to the survival of critical services.

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[1]William Gouveia, "Watershed Events in Health-System Pharmacy Practice," *American Journal of Health-System Pharmacy* 68 (August 1, 2011): 1405.

[2]Charles Hepler and Linda Strand, "Opportunities and Responsibilities in Pharmaceutical Care," *American Journal of Health-System Pharmacy* 47 (March 1990): 533-43.

[3]Gouveia, "Watershed Events," 1405.

[4]Nicole Paolini and Michael Rouse, "Scope of Contemporary Pharmacy Practice: Roles, Responsibilities, and Functions of Pharmacists and Pharmacy Technicians," *American Journal of Health-System Pharmacy* 67 (June 15, 2010): 1031.

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[17]Hepler, "Opportunities and Responsibilities," 539.

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CHAPTER 2

LITERATURE REVIEW

> I'll know it when I see it. That was Jobs' credo, and until he saw it his perfectionism kept him on edge.
>
> —Malcolm Gladwell on Steve Jobs, *The Tweaker*

Introduction

The purpose of this chapter is to provide analysis of available literature to establish the foundations of clinical pharmacy practice relevant to determining accurate staffing levels. To ensure complete coverage of this topic this chapter will be subdivided into four major sections that will provide historical and contemporary context necessary for future evaluation of the clinical pharmacy practice and available productivity monitoring techniques. The sections of this chapter include reviews of the literature pertinent to the following areas (1) evolution of contemporary clinical pharmacy practice; (2) current roles, responsibilities, and activities of clinical pharmacists; (3) methods utilized to determine CPS staffing; and (4) the current Army method for determining staffing. In their entirety, these sections will set the stage for value-based evaluation of current CPS activities.

The Evolution of Contemporary Clinical Pharmacy Practice

Although the roots of contemporary pharmacy practice in America date back to the Revolutionary war period, the concept of a professional pharmacist as we know it today did not exist during this time. In the 18th century, the line between physician and pharmacist was ill-defined, and in many cases the apothecary combined medical and pharmacy practice for those patients who could not afford the services of a trained

medical doctor.[1] Adding to the nebulous separation between the two disciplines is the fact that most medication compounding was accomplished by physicians who often owned and operated their own pharmacies in conjunction with their medical practice. In the early 1800s as hospitals began to become more commonplace, training of medical students to compound medications gave way to prescription writing and the emergence of the full-time position of the staff apothecary.[2] Because physicians then trained in an environment where they no longer compounded their own prescriptions, they relied upon the apothecary to provide this skill set, and as this generation of doctors transitioned to private practice they continued to rely on the apothecary to fill their prescriptions.[3]

As the frequency with which dedicated apothecaries dispensed medications increased, schools to train apothecaries were formed and the establishment of standards became necessary to ensure consistency in the practice.[4] Physicians of the era supported the development of the independent albeit subservient professional practice of pharmacy; however, as the apothecary became more independent, their focus shifted "to attending the ills of customers . . . [by] refilling prescriptions without physician authorization or directly treating customers."[5] In an era lacking in medical or pharmacy regulation the line between doctor and apothecary began to blur again; in fact, it was the growing competition between the two professions that spurred the establishment of the American Pharmaceutical Association, in 1852, in an attempt to establish internal standards for and to govern the profession.[6] Eventually, self-regulation led to legislative regulation that served to codify the delineation between physicians and apothecaries as well as to establish educational requirements of mastery for the practice of pharmacy.[7]

The profession of pharmacy continued to show staggering transitions in identity through the twentieth century and on into the twenty-first century. Early in the 20th century, still fulfilling the role as the apothecary responsible for the preparation and provision of medicinal drugs, the impetus was on professional knowledge and preparation of unadulterated products; however, this role and many of the professional requirements were to be curtailed with the rapid growth and acceptance of the pharmaceutical industry's pre-made medications as well as their capacity to synthesize new pharmaceuticals.[8] From the 1930s to the 1970s the percent of prescriptions requiring compounding dropped from 75 percent down to approximately 1 percent while during the same period, the number of prescriptions filled increased at an even faster rate.[9] Indeed, the dominance of the pharmaceutical industry coupled with the expansion in the number of pharmaceuticals served to narrow the role of the pharmacist to nothing more than an overworked medication dispenser.[10] The profession adopted internal regulations emphasizing this restricted role by including a provision in the American Pharmaceutical Association Code of Ethics from 1952 to 1969 prohibiting the discussion of therapeutic effects or the contents of a prescription with a patient.[11] Essentially, pharmacists of this period did little more than transfer ready-made pharmaceuticals from larger to smaller bottles. This remained the standard until the idea of clinical pharmacy emerged in the late 1960s prompting a revision in the Code to require pharmacists to make the health of the patient their first priority.[12]

Paul Abramowitz presented a cogent discussion of the evolution of the pharmacy practice model from this point until contemporary practice.[13] He described a snapshot in time during the nascent years of the clinical pharmacy concept where the conventional

practice model was still heavily distribution based, only a small group of pharmacists were attempting to establish relevancy in provision of clinical services, and opportunities for the doctor of pharmacy degree were limited. The clinical landscape for pharmacists during these early days was markedly less complex than the current healthcare system because there were fewer medications available and access to clinical data was limited to paper records that were largely unavailable to the pharmacist.[14]

"Though the 1960s saw the advent of clinical pharmacy practice, there was a period of professional transition in which pharmacists actually explored and defined what the specific opportunities and responsibilities would entail for clinical practice."[15] During this time, the profession was clearly in a state of metamorphosis, but it noticeably lacked direction or a unifying concept.[16] Hepler and Strand's landmark article, "Opportunities and Responsibilities in Pharmaceutical Care" published in 1989 provided this unifying concept by creating a mandate for the profession of pharmacy aimed at improving patient care with the introduction of the "Pharmaceutical Care" concept.[17] The term pharmaceutical care was first introduced by Mikeal et al. in 1975 as the aspect of medical care that ensured safe and rational medication therapy, then it was further developed by Brodie who tied it to the efficacy of medications provided to patients, and finally it was definitively established by Hepler and Strand.[18] They made the concept more comprehensive with their definition of pharmaceutical care as "the responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life."[19] More than simply defining a concept, their work served as a call for a paradigm shift in professional practice to a clear patient-centered focus.

Their characterization of the profession as a group looking for identity presented a bleak outlook for the pharmacists if a niche could not be carved from the healthcare system. This work thoroughly developed a case for the future clinical role of the pharmacist by highlighting an urgent need within healthcare for the management of drug related morbidity and mortality. Incidentally, this was a need that pharmacists had the unique knowledge and skills to address. They presented statistics indicating that up to a million patients a year required hospitalization with a proximate cause of adverse drug reactions.[20] This estimate although only slightly refined was supported by the 1999 Institute of Medicine report entitled *To Err is Human* that evaluated the impact of medical errors including medication related events nationwide.[21] This report indicated that preventable adverse drug events were responsible for over seven thousand deaths in 1993 alone with estimated total direct and indirect costs to the United States healthcare system amounting to approximately two billion dollars annually.[22] Further, the report's analysis indicated that the situation was getting worse. When the statistics from 1983, the beginning of the analysis, were compared with the statistics from 1993, they demonstrated a 2.57 fold increase in mortality attributed to medication related errors.[23] An independent report published in 2001 report by the Agency for Healthcare Research and Quality confirmed the seriousness of medication related morbidity and mortality in America indicating that over 770,000 adverse drug events occur each year resulting in the death or injury of the patient.[24]

Building upon the concept of clinical pharmacy developed in the 1960s with the development of "Pharmacy Care" concept, Hepler and Strand's work was significant for the profession in three ways. First, they presented a future professional identity for the

profession by reaffirming the idea that pharmacy's primary purpose should be clinical with a focus on the safe and effective provision of medications. They go on to identify the four criteria that pharmacists should meet prior to fulfilling this future clinical role: competence, administrative integration, integration with other healthcare professionals, and sufficient numbers to serve society. Second, they consolidated the definitions of many medication related concepts and related them. Among the most important concepts they succinctly present are: (1) the desired outcomes of drug therapy, (2) reasons for suboptimal drug therapy, and (3) the eight categories of drug-related problems (table 1). Additionally, they suggest seven steps that must be performed on each patient in the course of pharmaceutical care: "(1) Collect and interpret relevant patient information to determine if . . . [there] is a drug-related problem, (2) Identify drug-related problems, (3) Describe the desired therapeutic goals, (4) Describe feasible therapeutic alternatives, (5) Select and individualize the most appropriate treatment regimen, (6) Implement the decisions . . . (7) Design a monitoring plan." Finally, the work asserts that members of the profession by virtue of their unparalleled knowledge of pharmaceuticals were uniquely suited to address the rising numbers of medication related morbidity and mortality incidents observed within the healthcare system.[25] This important work signaled a change in the social commitment of pharmacists while also serving as both a call to action and a road map for the future of the profession, and members of the profession quickly became enthusiastic about the development of a professional clinical role in pharmacy care.[26]

Table 1. The Eight Categories of Drug Related Problems	
1. Untreated Indication	The patient has a medical problem that required drug therapy but is not receiving a drug
2. Improper Drug Selection	The patient has a drug indication but is taking the wrong drug
3. Subtherapeutic Dosage	The patient has a medical problem that is being treated with too little of the correct drug
4. Failure to Receive Drugs	The patient has a medical problem that is the result of his or her not receiving a drug (e.g., for pharmaceutical, psychological, sociological, or economic reasons)
5. Overdosage	The patient has a medical problem that is being treated with too much of the correct drug
6. Adverse Drug Reactions	The patient has a medical problem that is the result of an ADR or adverse effect
7. Drug Interactions	The patient has a medical problem that is the result of a drug-drug, drug-food, or drug-laboratory interaction
8. Drug Use Without Indication	The patient is taking a drug for no medically valid indication

Source: Created by author from Charles Hepler and Linda Strand, *Opportunities and Responsibilities in Pharmaceutical Care* (Bethesda, MD: American Journal of Hospital Pharmacy, March 1990), 535-536.

A telling phenomenon occurred after the introduction of the pharmacy care concept that underlies the significance this new paradigm had on the profession of pharmacy. As clinical pharmacy practice developed from its beginnings in the 1970s through its renaissance in the 1990s and as pharmacists embraced their new clinical and social role, the professional educational requirements began to change. Most notably, the Doctor of Pharmacy (Pharm.D.) degree first proposed in the 1950s which had limited availability through the 1970s began to replace the Bachelor's of Science in Pharmacy as

the entry-level degree. With the adoption of the Pharm.D., traditional pharmacy curriculums were adjusted to include instruction and internship hours in advanced clinical practice to address the issue of competence posited by Hepler and Strand no less than fifteen times in "Opportunities and Responsibilities in Pharmaceutical Care."[27] This advanced clinical training would ensure pharmacists were prepared for pharmaceutical care practice. In 2000, implementation of the American Council on Pharmaceutical Eduation accreditation standards for pharmacy schools established the Pharm.D. as the sole professional training program for the profession of pharmacy.[28] The impact is apparent; according to the latest report to the Pharmacy Manpower Project, the percentage of practicing pharmacists with the Pharm.D. increased from 17 percent in 2000 to 27 percent in 2009 and the overall percentage increases to 32.5 percent when other advanced degrees are considered in addition to the Pharm.D. (e.g. some respondents had both a Pharm.D. and Ph.D.)[29] The universal endorsement of a new clinically-oriented academic curriculum and post graduate work is an indicator of the acceptance of this role and practice model within the pharmacy profession.

Current Roles, Responsibilities, and Activities of Clinical Pharmacists

As the profession made the transition from dispenser of medications focused on the product to the pharmaceutical care practice paradigm, there was an expansion of the potential career paths and practice settings available to pharmacists who wanted a patient-care role.[30] A resource paper recently completed by the Council for Credentialing in Pharmacy (CCP), a coalition of thirteen national pharmacy organizations, identifies eighteen different patient-care roles for pharmacists in both traditional and nontraditional

health care settings. The services offered in these roles while categorically similar are by no means standardized; in fact, within each of these roles exist differing sub-roles and education requirements.[31]

An important concept described in this paper was that of the generalist and advanced generalist practitioners because the functions described for these roles encompass the collaborative activities of a clinical pharmacist operating in an inpatient clinical setting to optimize medication therapy and improve outcomes for the patient (figure 1).[32] The 2009 ASHP national survey on monitoring and patient education incorporates this generalist concept in its description of the three hospital pharmacy practice models. This survey defined the hospitals practice model as either drug-distribution centered, patient-centered integrated, or clinical-specialist-centered.[33] The patient-centered integrated model was defined as "a clinical generalist model with limited differentiation of roles–nearly all pharmacists [having] distributive and clinical responsibilities."[34] According to the CCP resource paper, a generalist is "a practitioner who provides continuing, comprehensive, and coordinated care to a population regardless of age, gender, disease state, drug treatment category, or organ system."[35] While an advanced generalist practitioner fulfils the same role, the acuity of the patient is more complex for the advanced generalist.[36] In agreement with this construct, Abramowitz posits that the practice of hospital pharmacy has evolved to the point where what would have been considered specialist clinical practice in the 1970s are generalist functions today.[37] In both cases, the generalist and advanced generalist roles described in the report are also supported by the American Pharmacists Association and the ASHP's positions on the principles of pharmaceutical care practice as well as conforming to the pharmacist

scope of practice limitations offered by American College of Physicians–American Society of Internal Medicine.[38]

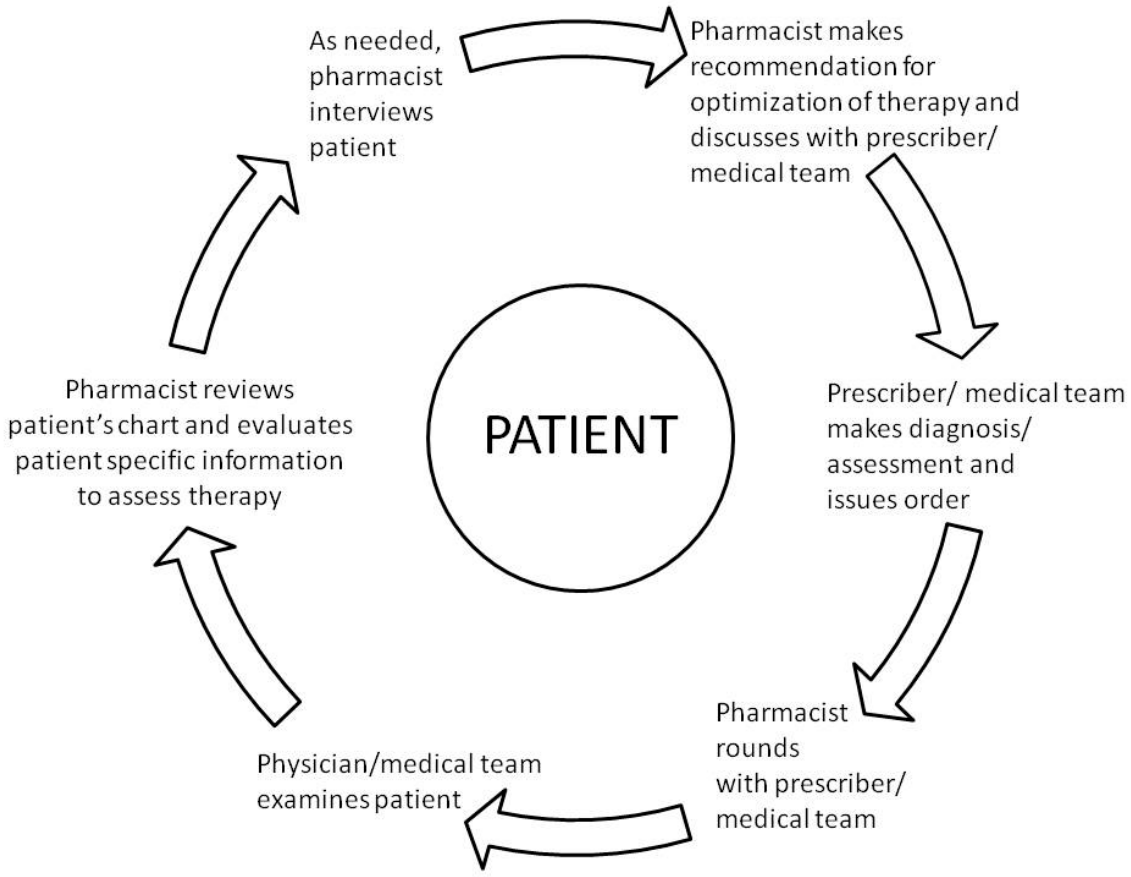

Figure 1. Inpatient Pharmacy Care Process to Optimize Medication Therapy
Source: Adapted from Nicole Paolini et al., *Scope of Contemporary Pharmacy Practice: Roles, Responsibilities, and Functions of Pharmacists and Pharmacy Technicians* (Washington, DC: Council on Credentialing in Pharmacy, February 2009).

With a general role established for CPS, it is important to examine the patterns of healthcare resource allocation devoted to the practice of CPS. The 2010 ASHP survey on prescribing and transcribing indicates that "more than 80% of hospitals provide consultations on dosage adjustments, drug information, pharmacokinetics, and

antibiotics. At approximately two-thirds of the hospitals, pharmacists provide anticoagulation consultations, and at about half of hospitals, pharmacists provide nutrition support consultations and patient teaching."[39] While not as robust in sample size as the 2010 ASHP survey described above, Gupta et al. presented the findings of their survey that provide a more detailed view of the types of CPS provided across the nation and stratified this data by hospital size. Perhaps most interesting about this work is that there was no significant difference in the percent of time spent on CPS between small, medium, and large hospitals with the hospitals reporting 22.0, 22.4, and 20.8 percent, respectively.[40] Nor were there many significant differences in the range of clinical services provided; however, when there were differences it was because the larger hospitals offered some services at a higher rate than smaller hospitals. For instance there was a significant difference in the percentage of small, medium, and large sized hospitals offering " Drug Therapy Monitoring," 70, 81.3, and 96.8 percent respectively.[41] The previously mentioned Pharmacy Manpower project report helps to quantify the amount of pharmacy resources that are allocated nation-wide to the provision of CPS. This 2009 report indicates that in the hospital setting pharmacists spend an average of 27 percent of their time engaged in "patient care services," which they define in very general terms as "assessing and evaluating patient medication-related needs, monitoring and adjusting patients' treatments to attain desired outcomes, and other services designed for patient care management."[42] The discussion above indicates that approximately 80 percent of hospital pharmacies, regardless of the size, spend between 20 to 27 percent of their time engaged in a varying array of CPS. This is not an insignificant outlay of resources considering that in 2010 the mean number of pharmacists employed per hospital not

including administrative positions was 11.1 full time equivalents at an average salary for a hospital pharmacist of $113,000.[43]

As previously discussed, the 2009 ASHP Survey discreetly categorizes the multiple variations of hospital pharmacy practice into three basic practice model constructs, based on the presence and status of clinical pharmacists within the organization. On one end of the spectrum, in the distributive model, there are little to no CPS and no clinical pharmacists, and on the other end of the spectrum, in the clinical-specialist-centered model, there are designated clinical pharmacists in the institution who have no distributive role. The patient-centered integrated model holds the middle ground where all pharmacists are expected to perform a distributive and clinical function.[44] According to this survey over half, 64.7 percent, of all hospitals surveyed operate in the patient-centered integrated model regardless of size. The highest percentage of those operating a clinical-specialist centered model were larger hospitals ranging from 29.6 percent for hospitals with between 300 and 399 beds up to 45.2 percent for hospitals with greater than 600 staffed beds.

While the 2009 ASHP survey, the 2010 ASHP survey, the 2009 manpower report, and the CCP report describe in general terms the functions of these positions and help quantify the prevalence of provision of CPS, none of these documents specify the day-to-day activities that are considered CPS. The literature is surprisingly sparse in defining a standardized set of activities that comprise CPS. Hepler, Abramowitz, and Gouveia, all well respected practitioners of clinical pharmacy and winners of the Harvey A. K. Whitney Lecture Award, a high honor in health-system pharmacy, independently acknowledge that while the profession accepted the responsibility of CPS to provide

pharmaceutical care and have proven a causal link with these services and significant improvements in cost and health outcomes, it has failed to adopt any list of activities that are considered the universal standards of practice.[45] As noted by Stuchbery et al. the range of CPS is well described; however, the activities that comprise these services are not well documented.[46]

Stuchbery's group attempted to catalog the activities completed by clinical pharmacists operating in an inpatient hospital setting through workload sampling via direct observation. Their work, while limited to only three non-sequential days of sampling, identified 28 separate activities performed by the pharmacist under observation. While there are limitations to the author's methodological approach, the work gives an impression of the range of activities performed by a clinical-specialist centered pharmacist in the course of their daily duties.[47] A refined list of activities produced through the collaborative efforts of ten national pharmacy organizations called the Pharmacist Practice Activity Classification provides a "hierarchical categorization of pharmacist's activities."[48] This list categorizes four domains of practice, and two of these domains consist of activities and tasks consistent with the definition of pharmaceutical care. Domain A contains 12 activities and 30 tasks concerned with appropriateness of therapy and outcomes. Domain D consists of 7 activities and 29 tasks concerned with pharmacist contribution to health systems management (see Appendix A). This information is specific enough to allow documentation of many common activities performed by pharmacists providing CPS.

Methods Utilized to Determine Clinical Pharmacy Services Staffing

As the profession of pharmacy works to establish clinical practice models within the healthcare system, establishing appropriate staffing levels is critical to ensuring sufficient numbers of generalists and specialists are available to fulfill the new roles. The Joint Commission on Accreditation of Healthcare Organizations, the accrediting body that surveys and accredits MHS hospitals, recently emphasized the need for staffing effectiveness when they released the "Interim Staffing Effectiveness Standards Approved for 2010" which requires organizations to identify performance variations or trends that impact safety or quality of care.[49] Consequently, one of the most pressing questions currently facing the profession is "How [does the profession] ensure that pharmacists are deployed at the proper ratios to both reduce adverse drug events and improve the effectiveness of the medications administered to all patients?"[50] Gupta et al. argue that measuring this type of productivity is very challenging because the range of services may be complex with activities that are hard to quantify, the intensity of CPS will vary based on patient acuity, and the lack of standardized CPS activities prevents universal performance measures.[51] His group surveyed 110 hospitals in 34 states to determine what productivity measures they utilized to assess their organizations, and discovered that the most frequently utilized metrics were FTEs per adjusted patient day, FTEs per dose dispensed, and FTEs per doses billed at 22.7, 20.0, and 20.0 percent respectively. Additionally, they found that in most cases, 79.1 percent of respondents, clinical activities were not included in the evaluation.[52] In those organizations that do measure clinical performance, significant problems exist with their clinical workload capture systems because they failed to differentiate the type of CPS provided or the time required

for the activity. Other issues identified with automated capture systems included (1) the amount of time required for entry of the intervention; (2) inability to weight an activity based on intensity; and (3) no consideration of patient acuity.[53]

The significance of Gupta's report is that clinical metrics are neither common nor standardized nationwide, and that more often than not hospitals will forego these measures in favor of more tangible staffing ratios. Shane and Gouveia agree with this indicating that the primary focus of staffing metrics have been on determining the efficiency of pharmacy operations by evaluating ratios of full time equivalent staffing with distributive workload, operational and inventory costs, staffed bed, or patient days.[54] This directly contradicts guidance provided by the ASHP position statement on practice management that specifically "discourages the use of . . . workload and productivity measurement systems based solely upon dispensing functions or a variant of patient days, because such measures do not accurately assess pharmacy workload, staffing effectiveness, [of] clinical practice contributions to patient care."[55] The ASHP practice management guidance provides no specific metrics for determining appropriate staffing levels; however, it does "define pharmacy workload as all activities related to providing pharmacy patient care services," and it establishes patient outcomes and total cost of care as ideal focus areas for metrics.[56]

Vermeulen et al. working in conjunction with the Health Systems Pharmacy Executive Alliance described the ideal performance elements that make up the seven dimensions of the High-Performance Pharmacy Practice Framework.[57] The High-Performance Pharmacy Practice is "one that aspires to maximize its contributions to the clinical outcomes of patients and the financial position of the health system by

functioning at the highest levels of effectiveness and efficiency."[58] The performance elements identified by the group were scored qualitatively via an extensive literature review for cost to implement, financial return, and quality and safety return.[59] The list of performance measures includes eleven that are specifically related to CPS. Of the CPS related elements, four of these are expected to realize a return on investment greater than 100 percent of the initial resources required to implement them, and eight elements are expected to produce substantial improvements in quality or safety. Their analysis provides value-based information for deciding which CPSs to implement, but it failed to provide any concrete quantifiable measures such as time-activity analysis or workload capacity ratios which are necessary for converting these measures into staffing requirements. The only staffing indicator included in this article was a qualitative assessment that determined if the activity would require greater or less than one full time equivalent pharmacist to implement, which provides little assistance in determining appropriate staffing levels per an institution's workload or census.

In the first of their two part series, entitled "Effective Use of Workload and Productivity Monitoring Tools in Health-System Pharmacy" Rough et al. explore the benchmarking statistics commonly employed to evaluate health-system pharmacies.[60] Benchmarking is a continuous process of comparing outcomes against those of a competitor to determine opportunities for organizational improvement.[61] Ideally, candidates for benchmarking CPS would include measures that have the highest likelihood of improving patient care.[62] Rough et al. argue that either improper application of benchmarks or inappropriate benchmarks are sometimes used as justification to decrease pharmacy staffing decreasing safety and quality within the institution.[63] They

point out two important problems encountered with the general application of benchmarking. First, they point out that determining effective measures of workload and productivity is a historic problem in health-system pharmacy writ large because there is "no gold standard for measuring health-system pharmacy productivity."[64] Second, if only costs or volume statistics are utilized with no consideration of quality of outcomes, then the data is potentially meaningless. In pharmacy there exists an inverse relationship between drug costs and labor costs. This means that if an administrator was looking at cost only statistics such as pharmacist FTEs per dose billed, they would think that the pharmacy was over-staffed if a CPS program was initiated that was effective in reducing overall drug costs by optimizing medication profiles. This could lead to improvement strategies that involve reductions in staff despite the fact that the extra staffing is actually producing better patient outcomes and overall system efficiency. This report continues to describe commonly applied external and internal benchmarks used in health-system pharmacy along with discussions of how they are misapplied or misinterpreted. On the subject of measuring CPS workload or productivity, they contend that there are wide variations in the methods used to report clinical services that are inconsistently captured either by automated information systems or by the clinical pharmacist. They argue that in order to be effective, a CPS workload productivity measurement system must include the following: (1) an efficient system for logging the activity; (2) an effective weighting system for competing interventions; and, (3) ability to accurately capture the time involved in an activity.[65] To utilize this type of system to establish staffing needs is considerably more complicated; however, as described below, the work of Toohey and

Knoebber describe their attempts to operationalize these principles into predictive staffing models.

Toohey et al. suggested a method to adapt the patient-care unit (PCU) pharmacy workload system developed previously for the University of California - San Francisco (UCSF) in 1980. The UCSF system required incorporation of staff estimates of time for routine activities performed by the staff. These estimates were then used to determine the PCU for that activity measured in minutes, and then these PCUs were multiplied by clinical staff activity logs to calculate mean staffing requirements. Toohey's group using the same basic premise simply adjusted the PCU weighting to reflect the realities at their institution by conducting observational time-motion studies and by convening staff panels to determine estimated times for those activities that were difficult to measure. The article presents the PCUs the group utilized to measure patient care activities along with the time weights for each PCU; however, many of the PCUs utilized were actually distributive in nature with only eight activities conforming to the conventional principles of PCS. Another limitation of this method is that the system relies upon the pharmacy staff to manually log the clinical PCUs, and the authors recognize that "it is sometimes difficult for . . . pharmacists to develop the habit of recording individual PCU occurrences. Often the actual occurrences happen in a rapid-fire manner or the pharmacist is so busy that recording the event immediately is impossible then it is forgotten."[66] The final limitation of this method is it fails to account for differences in patient acuity which could significantly alter the value of the PCU.

Adapting the work of Iglar et al. presented in "Time and Cost Requirements for Decentralized Pharmacist Activities," Knoebber et al. addressed the issue of determining

staffing based on patient acuity by describing the actual implementation of a standardized staffing model based solely on patient census adjusted for intensity of care.[67] They conducted a three month baseline study for different care areas (cardiology, pediatrics, oncology, etc.) to determine the frequency of select CPS activities, including administrative and teaching responsibilities, and estimated the time required per event in order to determine the average workload.[68] Then they correlated this workload data per care area with the patient acuity in each patient care area during the period of observation to determine a positive relationship between patient severity and increased workload.[69] This correlation data was used to determine the clinical standard for each type of patient care area studied. This clinical standard was then multiplied by the daily patient census after adjusting again for patient acuity in order to determine the required clinical staffing in hours. Unfortunately, the method utilized to determine patient acuity involved a nurse objectively evaluating the overall needs of the patient which is not necessarily an indicator of clinical pharmacy resources.[70]

In the second of their two part series, entitled "Effective Use of Workload and Productivity Monitoring Tools in Health-System Pharmacy" Rough et al. describe a similar but more refined process to that described Knoebber et al. Rough and colleagues present a four step process for developing a CPS workload measurement system: (1) establish the minimum standards for CPS activities required for every patient; (2) establish a time standard for completion of these activities via time-motion or work sampling studies; (3) establish an effective weighting system for competing interventions; and, (4) establish a volume indicator that signals the initiation of the CPS process that is automatically captured. With these elements in place determining workload is completed

by multiplying the time standard by the quantity of volume indicators, and this information can generate staffing requirements estimates for personnel justification.[71]

O'Leary et al. incorporated all of the elements of an ideal staffing model described by Rough et al. to develop a set of staffing estimates that were adopted into the practice standards of the Society of Hospital Pharmacists of Australia. The model they utilize is larger in scale but similar to that described by Knoebber et al. First, her group established the minimum standards of CPS activities. They utilized the ten activities listed in Society of Hospital Pharmacists of Australia's practice standards for providing comprehensive CPS (see table 2). Second, they established a time standard for those activities. They utilized robust time-motion studies data of 20,500 CPS interventions conducted for 4625 patients in order to establish a time standard for each activity. Third, they developed a weighting system. They stratified the time standards by the acuity of the patient based on the category of service to which they were admitted (critical care, medical, surgical, etc.). Lastly they established a volume indicator. They utilized the number of staffed beds per category of hospital service with an estimated fill rate of 95 percent. They accounted for administrative time or other time by incorporating a nonproductive factor of two hours per work week.[72] From this they were able to develop formulas to calculate the number of clinical pharmacists required to complete the required CPS activities on a per bed basis. This work was used by the Society of Hospital Pharmacists of Australia to revise their suggested standards for staffing levels which provides the number of dedicated clinical pharmacist FTEs on a per staffed bed basis. For example these standards indicate that there should be 1.0 clinical pharmacist FTE per every 10 critical care unit beds.[73]

Table 2. Society of Hospital Pharmacists of Australia Clinical Pharmacy Activities	
Clinical Activity	Description
Medication History	An interview with the patient/care-giver, reviewing documentation such as previous medicine orders, referral letters, admission notes, and patient medicine lists.
Assessment of Medication Management	Review of all medicine orders to ensure safe and appropriate dosage administration and to optimize medicine therapy and patient outcomes.
Clinical Review	Assessment of the patient and other parameters for the purpose of evaluating the response to medicine therapy and management.
Decision to Prescribe a Medicine	Provide guidance and recommendations in the form of information and expertise to contribute to optimal medication selections.
Therapeutic Drug Monitoring	Interpretation, monitoring, and communication of measured drug concentrations in body fluids to optimize drug efficacy and minimize toxicity.
Participation in Rounds	Attendance and participation at multidisciplinary ward rounds or meetings.
Provision of Drug Information to Health Professionals	Provision of medicine information to health professionals relating to a patient's therapy for the purpose of influencing the prescribing, administration, monitoring, and use of medicines.
Provision of Drug Information to Patients	Providing comprehensive information and advice to patients/care-givers to encourage safe and appropriate medicine use.
Information for Ongoing Care	Communication with health professionals (community pharmacists, general practitioners, hospital pharmacists from different institutions, other healthcare providers) to facilitate seamless transition between healthcare providers.
Adverse Drug Reaction Management	Prevention, detection, assessment, management, and documentation of adverse drug reactions.

Source: Created by author from SHPA Committee of Specialty Practice in Clinical Pharmacy, "SHPA Standards of Practice for Clinical Pharmacy," *Journal of Pharmacy Practice and Research* 35, no. 2 (June 2005): 122-46.

There are many challenges involved with accurately measuring clinical pharmacy workload. Consequently, it is very difficult to create effective systems to predict required staffing levels to accommodate future workload. There are no available universally accepted standards defining which activities comprise CPS, and consequently, there are no standards for clinical pharmacist staffing levels in American civilian hospitals. Lastly, although the literature provides no one model that is a panacea that can implemented to solve this problem, the general principles and required elements for a solution are available in the milieu of practice principles, benchmarking metrics, and staffing models.

The Current Army Method For Determining Staffing

Army Regulation 570-4, *Manpower Management*, is the primary reference governing Army manpower personnel, and it provides guidance on determination of workload requirements necessary for performance of "mission essential work."[74] It states the following regarding the methods the Army uses to determine staffing levels:

> Manpower levels will be logically developed from specific workload requirements that directly derive from missions directed or approved by higher headquarters. . . . In the context of requirements determination, workload management is defined as the act of describing the work to be accomplished, both near term and projected; estimating the time and resources required to accomplish the work at an acceptable level or standard; prioritizing the work to be accomplished; applying the available resources to accomplish the work; and evaluating the results against predetermined quantitative and qualitative standards.[75]

AR 570-4 provides a doctrinal framework for establishing staffing levels via a twelve step process that is prescriptive unless the organization has a model that is approved by Headquarters Department of the Army.[76]

The Automated Staffing Assessment (ASAM) Tool is the Army Medical Command's Headquarters Department of the Army approved staffing model used to

project required staffing levels at Army medical treatment facilities.[77] Given the lack of a standardized predictive staffing model, the current ASAM model for clinical pharmacists establishes a minimum personnel baseline that is based solely on the size of the medical treatment facility and that is independent of workload. The largest Army medical treatment facilities, Army Medical Centers, receive one clinical coordinator FTE and two clinical pharmacists (one focused on inpatient pharmacy operations and the other leading ambulatory clinical pharmacy initiatives) for a total of three FTE clinical pharmacists. Smaller Army Medical Department Activities are templated with one clinical pharmacist. Army community hospitals are allocated no clinical pharmacists according to the ASAM model.[78] Army MTFs are not prevented, however, from hiring clinical pharmacy staff beyond their templated number of clinical pharmacists based on their unique mission requirements and the extent of their CPS activities with other programs.

Summary

The above literature review describes the evolution of pharmacy practice through multiple stages of identity and the process of establishing itself as a clinical profession. One of the recognized gaps identified in this review is that an effective measure of the efficiency of CPS provided by clinical pharmacists is lacking. Although the literature highlights multiple attempts to develop a cogent model with varying degrees of success, it clearly demonstrates that the fundamental gap in developing an accurate clinical pharmacist staffing model is defining the activities that comprise CPS. Consequently, this knowledge gap specifically applied to the MHS is the research aim of this study. Future chapters detail the methodology utilized to study this issue along with the results and conclusions that can be drawn from this analysis.

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[6]Ibid.

[7]Ibid., 13.

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[74]Headquarters, Department of the Army, Army Regulation (AR) 570-4, *Manpower Management* (Washington, DC: Government Printing Office, 2006), 13.

[75]Ibid., 15-16.

[76]Ibid., 16.

[77]AMEDD Issues Program, "Review Issue (5916) Automated Staffing Assessment Model (ASAM)," Army Knowledge On-line, https://secure-akm.amedd.army.mil/cs_viewissue.aspx?i=5916 (accessed November 28, 2011).

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CHAPTER 3

RESEARCH METHODOLOGY

Introduction

This chapter describes the research and analysis methodology employed to answer the research question. This paper seeks to answer the primary research question: Which activities routinely performed by clinical pharmacists in the MHS should be included in a standardized list of clinical pharmacy services that should be provided to all inpatients? As discussed in the preceding two chapters, the roots of modern CPS date back as early as the 1960s when pioneers in the field recognized the potential impact that pharmacists' knowledge of medications could have on health care. The principle of pharmaceutical care codified by Hepler and Strand provided a unifying mandate for pharmacists to accept new social and clinical responsibilities. While members of the profession ambitiously pursued this new concept of care to establish it as valuable contributor to economic and patient outcomes, the profession as a whole failed to define the universal activities that would comprise CPS. This has led to an ill-defined concept of what actions should be considered CPS and what if any CPS activities should be performed for all patients. Establishing the required functions of a particular job is one of the initial steps in determining staffing requirements; consequently, defining an accurate and reliable staffing model for determining the appropriate number of clinical pharmacists has not been accomplished.

Design

This study utilizes qualitative analysis methods, incorporating a classic Delphi technique to collect and analyze data. Although it contains none of methodological features, this study contains foundation elements similar to grounded theory. In this it utilizes the pragmatic knowledge construct with the focus on the problem and a goal of developing knowledge claims based on actions and consequences.[1] Rather than beginning with a theoretical position this qualitative approach allows for the construction of a theory or in this case a list.[2] Accordingly, this study did not seek to validate a preconceived notion that any one CPS activity was valuable; instead, the study sought to build a knowledge construct and consensus regarding the relative value of individual CPS activities.

Characteristics of Qualitative Research

Qualitative research belies a strict definition due to the changing nature associated with this form of inquiry and its methods; however, Denzin and Lincoln propose that "Qualitative research is a situated activity that locates the observer in the world. It consists of a set of interpretive, material practices that make the world visible. . . . Qualitative researchers study things in their natural settings, attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them."[3] Creswell defines qualitative research as "the study of research problems inquiring into the meaning individuals or groups ascribe to a social or human problem . . . [using] an emerging qualitative approach to inquiry, the collection of data, and data analysis that is inductive and establishes patterns or themes."[4] Whereas neither definition narrows the scope of what qualitative research actually is, they do provide insight into the character of actions

that typify qualitative inquiry. Key elements of this type of research drawn from these definitions are that qualitative research is both naturalistic and interpretive, and these definitions both indicate that the goal of qualitative research is to derive meaning from observations.

Strengths of Qualitative Research

The strengths of qualitative research lie in its ability to more fully develop a comprehensive view of a research problem. Creswell created a composite of nine characteristics common to qualitative research that represents the strengths of this method.[5] First, qualitative research is conducted in the subject's natural setting in order to allow for observation in context.[6] This study consisted of an analysis of primary literature that cannot be separated from its environment, telephone interviews, and questionnaires completed in the subject's office. Although, not the ideal mechanism for conducting research, given financial constraints involved with the study, the telephone represented a better research solution for the initial round of questioning than other less intimate methods. Second, the researcher is a key part of the process by collecting the data first hand. In this study, the researcher reviewed all literature, conducted all of the interviews, and interpreted all of the surveys.[7] Third, qualitative inquiry involves multiple data streams including literature, visual data, interviews, et cetera to provide a preponderance of data.[8] For this analysis, literature, interviews, and surveys were utilized to provide data. Fourth, qualitative research is inductive and involves synthesis of raw data into themes and categories.[9] Through the course of the literature review, common themes were determined, and these themes informed the construction of interview questions. Further, interview answers were analyzed for patterns amongst the interviewees and these

pooled responses informed subsequent questionnaire development. Fifth, there is a focus on the participant's meaning of an event and avoidance of the observer's meaning that is informed by a different set of experience or prior research.[10] This is the driving factor for selection of interviewees. Because the research was looking for a best fit answer, it was important that those selected for interviews had the requisite expertise and experience to provide the best context for their answers. Sixth, the design of a qualitative study is informed by the initial research and it emerges throughout the process.[11] For this study, the initial literature review helped to clarify and focus the actual research problem and led to the development of initial interview questions. Seventh, qualitative researchers sometimes choose to view research through a theoretical lens to clarify the context around events; however, there was no theoretical lens applied to this research.[12] Eighth, qualitative research relies on the researcher to interpret what they see, hear, and feel, and this means the research can be biased by the researcher's own background, experiences, and understanding.[13] Finally, qualitative researchers attempt to develop the most complex description of the research problem in order to identify the underlying phenomenon that explains the observed behavior.[14] Due to the flexible and dynamic nature of qualitative inquiry one would expect that a study may not display all of these characteristics; however, the methodology of a qualitative study would become suspect should a preponderance of these characteristics be absent.

Weaknesses of Qualitative Research

Hancock indicates that each of the fundamental characteristics of qualitative research could be considered strengths or weaknesses depending on the research goal.[15] The most recognized weakness of qualitative research is a perceived lack of rigor

associated with qualitative methodology. The inherent flexible nature and sometimes ill-defined and dynamic methodologies make establishing and demonstrating rigor difficult.[16] Consequently, the results are not well understood or accepted in the scientific community; therefore, the conclusions drawn may be less credible.[17] Additionally, the mere presence of the researcher can affect responses from subjects under study, and the researcher's biases can skew interpretation of the data collected. These major weaknesses can be mitigated through the use of a recognized research approach to increase the "rigor and sophistication of the research design."[18] The researcher must identify and follow the approach although mixing procedures may be required.[19]

Methods

Two primary methods were utilized to answer the primary research question. The first method consisted of a review of available literature to identify knowledge gaps and focus the research question. Literature for review was identified utilizing a MEDLINE database search and a subsequent snowball sampling technique to identify additional resources from those articles in areas where initial citations were sparse. Reviewing primary and secondary literature detailing the evolution of clinical pharmacy provided background and context illustrating the inherent responsibilities of this type of pharmacy practice. Reviewing policy and position statement from key national pharmacy organizations such as ASHP and APhA served to provide the professional view of many CPS-related activities and to validate the need for this research. Reviewing the literature concerning the current activities of clinical pharmacists along with the relative value of CPS activities and productivity monitoring schema provided invaluable information about the perceived importance and value of many CPS activities. Although not

identified during a literature review, review of briefing slides provided by the Army Medical Department Manpower Management Branch provided background information on the Army ASAM model.

The second method of analysis employed by this study was a classic Delphi technique. The Delphi technique typically consists of multiple rounds of questions presented to a group of experts for the purpose of gaining consensus.[20] This method is utilized to efficiently gather the focused opinions of a panel of experts, but it differs from a typical panel discussion in that the participants have no direct contact and remain anonymous through the process except for revealing their qualifications in some cases.[21] This method "replaces direct confrontation and debate by a carefully planned, orderly program of sequential individual interrogations . . . respondents are asked to give reasons for their expressed opinions . . .this technique puts the emphasis on informed judgment."[22]

There are five characteristics of a classic Delphi study.[23] First, the technique utilizes a panel of experts. Adler and Ziglio establish four requirements for expertise: "(1) knowledge and experience with the issues under investigation; (2) capacity and willingness to participate; (3) sufficient time to participate in the Delphi; and, (4) effective communications skills."[24] Vernon indicates that expertise can be tailored to the context of the study, and the researcher needs to define and justify the criteria of the panelists utilized.[25] The criteria employed for expertise in this study was at least ten years experience with CPS in the MHS. Second, the panelists must maintain their anonymity. In reality this is better termed semi-anonymity because their identity is known to the researcher; however, by maintaining anonymity between panelists, the potential for one

person to dominate the discussion is reduced.[26] Third, the study is conducted in multiple iterations that allow panelists to refine their positions. This study consisted of four iterations including one interview and three rounds of surveys. Fourth, the panelists receive controlled feedback between iterations of the study to inform their subsequent decisions and allow them the opportunity to change their stance. After each round, panelists received summarized data from the previous round including their previous responses and the aggregate median and mode for each item from the panel as a whole. Finally, there is statistical analysis of the panel responses.[27]

For this study, a panel consisting of six senior Army Pharmacy military and civilian leaders was administered a four round Delphi survey. All panelists were informed of the potential risks associated with this study and all signed a consent form releasing their answers for use in this study (Appendix B). All transcripts were validated by each of the panelists to ensure accuracy.

In the first round, the panelists were queried using a semi-structured interview designed to determine their level of experience with CPS, establish their attitudes regarding the value of these CPS activities, and to develop an initial list of CPS activities for inclusion in the MHS standardized list. The telephonic interview consisted of survey-like closed-ended questions to collect demographic information combined with open-ended exploratory questions to solicit panelists' opinions regarding CPS value in the MHS, CPS staffing, and methods used to capture CPS workload (Appendix C). Data reduction for interview transcripts was conducted via a process of an intuitive summarization or categorization of the comments found in the validated interview transcripts. This type of thematic analysis method is similar to that used for thematic

analysis of case studies in that the researcher looks for patterns and makes "naturalistic generalizations" about those patterns.[28] These themes were developed to provide context for CPS in the MHS, but that is where the thematic development stopped. There was no attempt to determine participant meaning nor was there a reason to attempt to stratify based on any one demographic factor.

The second round utilized a survey instrument developed from the summarized first round data administered via electronic mail that asked the panelists to rank each activity on a four point Likert scale (Appendix D). Utilization of electronic mail is recognized as a valid mode of interaction for the purposes of conducting a Delphi study.[29] The four point scale was utilized to force the panelists to make a decision to either include or exclude an activity from the list. This survey data was then analyzed as ordinal data for measures of central tendency to include median and mode, and these summarized statistics were provided to the panelists in the next survey round.[30] Each item on successive rounds was also evaluated for consensus and stability.

There is no set level of consensus identified as a standard in the literature for Delphi studies, and levels of agreement required has ranged from 51 to 100 percent.[31] Additionally, there are many methods available to determine the stability of responses between rounds. Because there were less than 30 participants, survey data was treated as nonparametric data; accordingly, stability was identified by evaluating the Spearman's Rank Correlation Coefficient between the rankings in successive rounds.[32] Items were deemed to be stable if they exceeded the Spearman's rank correlation coefficient critical value at an alpha level of 0.05 for six participants, 0.829, meaning there is a 95 percent chance that the item had indeed stabilized if the calculated coefficient for that item

exceeds 0.829.[33] Items that reached consensus on the last iteration of the study were considered to be at consensus regardless of stability because it was assumed that the items would have stabilized with successive rounds. Consensus was defined as a median Likert rating of greater than three for each activity.[34]

The classic Delphi study shares many of the typical weaknesses of other qualitative methodologies; however, it has some unique limitations. First, rather than consensus, Delphi studies may produce or force compromise and develop a manipulated consensus. Panelists may feel pressure to conform despite the protections provided by the study protocol and conform to the group answer.[35] Second, there is a high potential for the monitor to shape the outcome of the study through selective inclusion or exclusion of comments or items they perceive as relevant or trivial.[36] Third, the results are dependent upon the expertise of the panelists relative to the research question.[37] Finally, the results may only represent that of the selected group of respondents; therefore, they may not be generalizable.[38]

Although these are valid criticisms of the study technique, this method is regarded as appropriate under the proper circumstances. "Linstone identified two circumstances where Delphi techniques are most appropriate: (1) 'the problem does not lend itself to analytical techniques but can benefit from subjective judgments . . . (2) individuals who need to interact cannot be brought together in face-to-face exchange'."[39] This research met both of those criterion. Whereas the review of literature focused the primary research question and was certainly valuable in developing information gaps and informing the development of the initial interview, the Delphi analysis and the associated interviews

with the subject matter experts give the information context and applicability to the MHS system.

Summary

This chapter laid out the overall methodological framework for the research conducted in this study, and it discussed the strengths and weakness of the methods utilized. As discussed qualitative methods lack the traditional rigidity associated with quantitative research and are sometimes perceived as weaker methods; however, their flexible style and adaptive approach lend them to complex problems that quantitative methods are unable to thoroughly investigate. Additionally, qualitative methods consider and codify the more nebulous aspects of a research question thereby developing more complete answers to the questions. The Delphi technique employed in this study is a tool for developing group consensus absent the peer-pressure and other inhibitions associated with a usual panel discussion. This process benefits from the combined expertise of the panelists and is a unique data source for a complex problem. The next chapter, Analysis, will present the results of this research in terms of the themes developed by the experts during the initial interview and the consensus developed through the iterative survey process.

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[2]Martin B. Davies, *Doing a Successful Research Project* (New York: Palgrave Macmillan, 2007), 135-136.

[3]Norman K. Denzin and Yvonna S. Lincoln, eds., The *SAGE Handbook of Qualitative Research*, 3rd ed. (Thousand Oaks, CA: Sage Publications, Inc, 2005), 3.

[4]John W. Creswell, *Qualitative Inquiry & Research Design: Choosing Among Five Approaches*, 2nd ed. (Thousand Oaks, CA: Sage Publications, Inc, 2007), 37.

[5]Ibid., 37-39.

[6]Ibid., 37.

[7]Ibid., 38.

[8]Ibid.

[9]Ibid.

[10]Ibid., 39.

[11] Ibid.

[12]Ibid.

[13]Ibid.

[14]Ibid.

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[16]Claire Anderson, "Presenting and Evaluating Qualitative Research," *American Journal of Pharmaceutical Education* 74, no. 8 (October 11, 2011): 1-7, http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2987281/pdf/ajpe141.pdf (accessed February 19, 2012).

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[18]Creswell, *Qualitative Inquiry*, 45.

[19]Ibid.

[20]Felicity Hasson, Sinead Keeney, and Hugh McKenna, "Research Guidelines For the Delphi Survey Technique," *Journal of Advanced Nursing* 32, no. 4 (April 17, 2000): 1009-1010.

[21]Bernice B. Brown, *Delphi Process: A Methodology Used For the Elicitation of Opinions of Experts* (Santa Monica: RAND Corporation, 1968), 3.

[22]Ibid.

[23]Gregory J. Skulmoski, Francis T. Hartman, and Jennifer Krahn, "The Delphi Method For Graduate Research," *Journal of Information Technology Education* 6 (2007):

1-21, http://bern.library.nenu.edu.cn/upload/soft/0-article/+03/JITEv6p001-021Skulmoski212.pdf (accessed February 19, 2012), 2-3; Wesley Vernon, "The Delphi Technique: A Review," *International Journal of Therapy and Rehabilitation* 16, no. 2 (February 2009): 70-71.

[24]Skulmoski, "The Delphi Method for Graduate Research," 4.

[25]Vernon, "The Delphi Technique," 71.

[26]Chia-Chia Hsu, "The Delphi Technique: Making Sense of Consensus," *Practical Assessment, Research and Evaluation* 12, no. 10 (August 2007): 1-8, http://pareonline.net/pdf/v12n10.pdf (accessed February 19, 2012), 2.

[27]Skulmoski, "The Delphi Method for Graduate Research," 2-3; Vernon, "The Delphi Technique," 70-71.

[28]Creswell, *Qualitative Inquiry*, 163.

[29]Skulmoski, "The Delphi Method for Graduate Research," 11; Hasson, "Research Guidelines for the Delphi Survey Technique," 1011.

[30]Selma A. Kalaian and Rafa M. Kasim, "Terminating Sequential Delphi Survey Data Collection," *Practical Assessment Research and Evaluation* 17, no. 5 (January 2012): 2, http://pareonline.net/pdf/v17n5.pdf (accessed March 9, 2012).

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[33]Norman Marsh, "A Glossary of Statistics," Statistics Glossary, http://linkage.rockefeller.edu/wli/glossary/stat.html (accessed February 19, 2012).

[34]Hsu, "Making Sense of Consensus," 2.

[35]Yousuf, "Using Experts' Opinions Through Delphi Technique," 3.

[36]Vernon, "The Delphi Technique," 74.

[37]Ibid.

[38]Yousuf, “Using Experts’ Opinions Through Delphi Technique,” 5.

[39]Ibid.

CHAPTER 4

ANALYSIS

Introduction

This chapter will present the data that derived the Delphi technique applied to the primary research question: Which activities routinely performed by clinical pharmacists in the MHS should be included in a standardized list of clinical pharmacy services that should be provided to all inpatients? It will initially provide the summary demographics of the panelists contributing to the Delphi study in order to establish their expertise in the field. Then it will present the relevant themes derived from the first Delphi round, semi-structured interview, regarding senior leaders' impressions of various aspects of CPS in the MHS. It will end with a presentation of the survey data developed in the subsequent Delphi rounds, and it will summarize the group's consensus decision for those items that should be included in the MHS standardized list of activities that comprise CPS. A data reduction table illustrating significant statements from the interviews and derived themes can be found in Appendix E, and a summary spreadsheet of the panelists' round-by-round survey responses along with the Spearman rank coefficient analysis data between each round can be found in Appendix F. The summarization of the data presented in this chapter will be utilized to draw substantive conclusions in the last chapter of this document, Conclusions and Recommendations.

Panel Demographics

Questions one through nine of the round one interview were demographic questions related to the panelists' level of experience. The Delphi panel for this study

included six members consisting of three active duty Army Pharmacy Officers with the rank of Colonel and three retired Army Pharmacy Officers currently serving as civilian pharmacists in the MHS. Two of the three civilian pharmacists attained the rank of Colonel prior to retirement. All panelists completed a Doctor of Pharmacy degree, and all but one completed at least one post graduate pharmacy residency. Two panelists completed two post graduate residencies, and two panelists have advanced degrees or fellowships in the allied areas of medicine or health. Four panelists served as residency directors for an ASHP accredited pharmacy residency, and four of the six panelists served or are currently serving as a pharmacy chief at an Army medical center with greater than two hundred beds. In total the six members of the panel possessed 157 years of experience within the MHS and 89 years providing CPS within the MHS. All panelists completed all four iterations of the Delphi process.

Interview Thematic Analysis

The Value of CPS in the MHS

Question ten of the round one interview dealt with the panelists' impressions of the value of CPS in the MHS. Overall, the panel strongly agreed that CPS was valuable, using terms like "essential" and "critical."[1] Three major themes developed from the panelists' responses on this topic. First, CPS in the MHS is as valuable as CPS in the civilian sector because there are only minor differences in the practice activities and environments. The implication of this theme is that the literature proving the value of CPS in the civilian sector is generalizable to the MHS. Second, CPS in the MHS improves patient outcomes. The panelists indicated that this has not been well proven system-wide in the MHS, but they point to the civilian literature as proof of this

contention. Finally, CPS in the MHS is inconsistently provided due to resource constraints such unavailability of trained personnel as well as insufficient budget to fill clinical positions.

CPS for All Inpatients

Questions eleven through thirteen of the initial interview dealt with the panelists' impressions of availability of CPS to all inpatients in the MHS. Overall, the panel strongly agreed that CPS was a necessary component of care for all inpatients with one panelist suggesting that this was "the standard of care in 2012." However, most agreed that while this was the goal, the MHS was not sufficiently staffed to provide CPS to all inpatients.

Four major themes developed from this line of questioning. First, all inpatients require some level of CPS, but they do not all require the same level of intensity of CPS. "It may just be a one-time encounter; it may last for half an hour or less, or with other patients, you may have to meet with them every day to do follow-up."[2] Second, as a consequence of personnel restraints, there is a need to prioritize the assignment of those clinical specialists to the more complex patients. "Unfortunately, pharmacists are a finite resource, and because your resources are limited; especially clinical pharmacists for the inpatient care areas, I think you need to dedicate those resources to the patients where they would have the greatest impact."[3] "In an ideal world, I'd say yes [that all patients should receive CPS], but with constraints we will have to risk stratify individuals to determine where we want to assign resources."[4] Third, provision of CPS to all inpatients will require changes in infrastructure and personnel roles. This suggests that the keys to the ubiquitous provision of CPS lie not with additional staffing but instead with more

efficient use of currently available staff and systems. The panelists suggested that increasing the roles and responsibilities of the pharmacy technician is one method to free pharmacists to perform clinical functions. Another important step is the integration of information systems to decrease the amount of work created by incompatible interfaces. The last theme that emerged from these three questions addressed the question of value. The panelists indicated that convincing the leadership at a variety of levels (e.g., military treatment facility, TRICARE Management Activity, etc.) that the return on investment is significant and sufficient to justify the expense is a continued requirement for both maintaining current clinical staffing and justifying future positions.

Staffing in the MHS

Questions fourteen and fifteen of the initial interview dealt with the panelists' experience with and impressions of staffing in the MHS. Five of six panelists had experience with the Army's ASAM, and the modeling procedure was explained to the panelist who had no experience with ASAM prior to questioning. All panelists felt the current ASAM model was inadequate to determine clinical pharmacist staffing levels for their institutions. Another theme that developed with these two questions was that the model for clinical pharmacists should be based on the number of patients who require care rather than the size of the institution or the workload.

Alternate Staffing Methods

Question sixteen dealt with alternate methods utilized by the panel to justify or acquire additional staffing. Overall, the majority of panelists indicate that they had been largely unsuccessful in acquiring additional staffing regardless of the technique used.

However, three dominant tactics emerged from the group responses. First, panelists acquired additional staffing following ad hoc requirements based on command initiatives or through interdepartmental trades. The limitation with this method is that because the authorizations are not official, the longevity or durability of the new positions is undefined. Second, developing partnerships with other departments in an attempt to influence future allocations is a key to both protecting current positions and acquiring additional non-authorized positions. Third, panelists attempted to gain additional clinical staff by quantifying clinical workload and outcomes value using their existing staff. This last method is apparently the most complex and least successful technique due to variances in data capture and valuation.

Value of Available CPS Workload Capture Systems

Question seventeen of the initial interview dealt with the panelists' impressions of available commercial off the shelf CPS workload data capture systems that they had used in the past. Overall, the panel with one exception indicated that these systems are not of great value and in many cases are not practical. Three major themes developed from this question. First, these systems create additional work for the clinical pharmacist. Because these systems exist outside of the standard information systems, they require a complete re-entry of all clinical activity details, and this becomes a cumbersome and time-consuming process for an already taxed resource. Second, utilizing the current information systems to capture the data in either an integrated system or in a passive manner is the best method if one attempts to quantify clinical workload. Finally, because these systems utilize value approximations for the savings generated by an intervention, they may not accurately reflect the value of the intervention.

Routine CPS Activities

The final initial interview question asked the panelists to list the activities that they would include in the standardized list of activities encompassed by CPS in the MHS. A concise list of activities was generated during the actual interview and verified with the panelist for inclusion on the subsequent survey rounds. A total of twenty-four activities were generated from panelists responses, and a frequency distribution for each activity was provided in the first survey round survey. A table illustrating significant statements from the interviews can be found in Appendix E.

Survey Results

Three rounds of Likert surveys were completed by panelists. Of the twenty-four initial activities provided by the panelists, fifteen reached the established level of consensus with a median greater than three (table 3). All items reached the defined level of stability after the second round of surveys, a Spearman rank coefficient greater than the critical value at an alpha level of 0.05. This indicates that there was little variation from the first to the second survey round; in fact, nine items had a coefficient of 1.0 meaning they did not change at all between these rounds. The final round of surveys was conducted despite reaching the potential termination criteria to allow for the development of greater stability, which did occur. Between survey round two and three the number of survey items at a coefficient of 1.0 increased to twelve. Interestingly, while stability may have increased in subsequent rounds, the items reaching the threshold for consensus did not change. A summary spreadsheet of the panelists' round-by-round survey responses along with the Spearman rank coefficient analysis data between each round can be found in Appendix F.

Results Validation

Comparing the results of this Delphi survey with the activities that the SHPA included in their standard list of CPS activities after an exhaustive literature review, reveals many consistencies. Only one activity selected by the SHPA was not included by the Delphi panel, and all but one activity selected by the Delphi panel could be correlated with activities selected by the SHPA (table 4).[5] The SHPA included participation in rounds as a standard activity, and while the Delphi panel did select this and all agree that it should probably be included in the list, the level of consensus was not strong enough to warrant inclusion. The other item that did not correlate between the two lists was the graduate medical education support activity included by the Delphi panel. This may be more of a reflection of the SHPA including only direct patient services. The panelists expressed that supporting graduate medical education indirectly impacts patient outcomes by affecting practice habits; however, it is likely that the SHPA did not make this connection. A high degree of correlation between these two independent studies suggests that these Delphi results are accurate.

Table 3. CPS Activities Reaching Stable Consensus	
Admission medication history/interview	Lab monitoring
Medication reconciliation	Medication dosing adjustments
Discharge counseling	Intravenous-to-oral medication conversion
Drug selection recommendation	Patient education
Prospective order review	Provider encounters/education
Medication interaction monitoring	Drug information provision
Drug therapy monitoring	Graduate Medical Education support
Pharmacokinetic monitoring	

Source: Created by author.

Table 4. Correlation of Delphi CPS Activities to SHPA CPS Activities	
Delphi CPS Activities	**SHPA CPS Activities**
Admission medication history/interview	Medication History
Drug therapy monitoring	Therapeutic Drug Monitoring
Prospective order review	Assessment of Medication Management
Medication reconciliation	Information for Ongoing Care
Discharge counseling	
Drug information provision	Provision of Drug Information to Health Professionals
Drug selection recommendation	Decision to Prescribe a Medicine
Patient education	Provision of Drug Information to Patients
Intravenous-to-oral medication conversion	
Lab monitoring	Clinical Review
Medication dosing adjustments	Adverse Drug Reaction Management
IV/PO conversion	
Pharmacokinetic monitoring	
Provider encounters/education	
Graduate Medical Education support	No Match
No Match	Participation in Rounds

Source: Created by author from SHPA Committee of Specialty Practice in Clinical Pharmacy, "SHPA Standards of Practice for Clinical Pharmacy," *Journal of Pharmacy Practice and Research* 35, no. 2 (June 2005): 122-46.

Summary

This chapter presented the results of the methodology discussed in chapter 3. The Delphi method provided an opportunity for the panelists to give overall context to CPS in the MHS and to define those activities that should be included in routine CPS. The major themes emerging from the panelists' interview responses give unique insights into the value of CPS in the MHS, clinical pharmacy staffing levels and models, and methods used to capture CPS workload. The multi-round survey identified fifteen CPS activities for inclusion in the standardized list, and these items correlate to a high degree with an independent study that utilized an alternate methodology, suggesting the results are valid. These results will be addressed in the next chapter, conclusions and recommendations.

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[1]Telephonic Interview with Delphi Panelist 1, Fort Leavenworth, Kansas, March 22, 2012.

[2]Ibid.

[3]Telephonic Interview with Delphi Panelist 2, Fort Leavenworth, Kansas, March 23, 2012.

[4]Telephonic Interview with Delphi Panelist 4, Fort Leavenworth, Kansas, March 26, 2012.

[5]Society of Hospital Pharmacists Association Committee of Specialty Practice in Clinical Pharmacy, "SHPA Standards of Practice For Clinical Pharmacy (Supplement)," 144-45.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

> Now this is not the end. It is not even the beginning of the end. But it is, perhaps, the end of the beginning.
>
> —Sir Winston Churchill, The Lord Mayor's Luncheon, 1942

Introduction

The purpose of this study was to answer the question: Which activities routinely performed by clinical pharmacists in the MHS should be included in a standardized list of clinical pharmacy services that should be provided to all inpatients? This question is significant because it addresses a key standardization gap important for creating a consistent definition of the job functions of clinical pharmacists within the MHS. As the Whitney Award winners Hepler, Abramowitz, and Gouveia pointed out along with Stuchbery et al., the range of CPS is well described; however, the activities that comprise these services are not well documented.[1] This standardization is then the critical first step in producing a staffing model that accurately forecasts the requirements for clinical pharmacists within the MHS.

What are those routine activities performed by clinical pharmacists that should be included in a standardized list of activities that should be provided to all inpatients? Ultimately, the answer to this question requires a discussion of the key themes developed from the Delphi interviews in order to provide context to the response. Otherwise, it may be inferred that the list generated by the panel comprise the only activities that should be counted as CPS, and consequently, these are the activities that should be counted as workload in future staffing models. This is not the case according to the literature and the

Delphi panel comments, so a discussion of the major themes from these sources is warranted prior to providing conclusions relative to the list of routine CPS activities.

The first two chapters identified and established the background and standardization gap described above, and the previous two chapters delineated the methodology used to study this problem and the data that was developed in the course of that research. This chapter provides conclusions and discussion based on that data to address the research question. As discussed in the limitations, delimitations, and scope sections of the first chapter, the constraints on this study with regard to funding and time prevented a broader and more detailed investigation; however, this work provides the foundation for further research.

Discussion and Conclusions

Through the course of this research three major themes became evident that will bear on any recommendations for the development of an accurate clinical pharmacist staffing model. First, CPS in the MHS is valuable enough to provide to all inpatients. Second, the MHS is not adequately staffed to provide a consistent level of service to all inpatients. Third, a workload-based staffing model is not appropriate to forecast inpatient CPS staffing requirements. These themes reaffirm the significance of this topic and provide the context for the CPS activities identified by the panel.

The first theme identified is that CPS provided in the MHS is likely to share the same level of value proven in multiple studies of civilian CPS, and some level of CPS should be provided to all inpatients. Although there is little data in the literature specific to the MHS, the experts on the Delphi panel overwhelmingly indicated that the provision of CPS improves patient outcomes and likely reduces costs system-wide. The panel

argued that because there are little to no differences between military and civilian practice settings, the value attributed to one setting is generalizable to the other. The literature clearly supports the value of CPS in various civilian practice settings as discussed in chapter 2 of this study.

The second theme identified is that current MHS clinical pharmacist staffing levels are inadequate to provide CPS to every inpatient, and the current ASAM staffing model does not provide accurate forecasts of clinical pharmacist manning requirements. According to the panel, given the current staff levels, it would require significant improvements in information and automation systems along with alterations in the role of the pharmacy technician and staff pharmacist to accomplish this goal. Additionally, current resource constraints both in authorizations and hirable clinical pharmacists would require a prioritization scheme regulating the level or intensity of CPS provided based on patient acuity.

The third theme identified is that workload counting for clinical services is impractical and does not accurately assess the impact and value of CPS. Although two of the panelists reported positive experiences with available data capture systems, all panelists reported significant limitations to available systems. The Delphi panelists' comments illustrated in the previous chapter correlate well with the challenges described in the literature regarding attempts to quantify clinical tasks.[2] This supports a staffing system similar to the four step model described by Rough et al. based on overall service provided rather than individual tasks performed.[3]

To specifically address the research question now is a simple matter. The panel identified fifteen activities that should be included in the list of routine CPS in the MHS.

Those activities are illustrated in the previous chapter (table 3), and they correlate well with other independent studies that applied different methodology to the same problem (table 4).[4] This list appears to comprehensively address the involvement of a clinical pharmacist at every step in the inpatient care process from admission, to treatment, and at discharge. These are the activities that should be included in the definition of CPS that is provided to every inpatient.

No activity included in the initial survey reached the criteria for exclusion, so all twenty-four activities identified by the panel could have been included in this list. Two factors were important in developing the inclusion criteria established in chapter 3. First, the Likert scale in the surveys forced the panelists to either include or exclude each activity, so a potential exists for panelists to see marginal value in an activity and therefore not discard it. Second, given the potential artificial consensus building effects of the Delphi method, it was possible that pressure from the group statistics would cause panelists to give a previously excluded activity marginal support.[5] To counter the potential to give marginal support, the inclusion criteria required a majority of panelists to strongly support the inclusion of an activity on the list. This is not to say that given a larger sampling base that the results might not change. As discussed as one of the weaknesses of a Delphi study, the results only represent the opinions of the experts surveyed, and may not be generalizable to the profession writ large.[6] These fifteen activities selected by the group should be viewed as a starting point for a larger discussion within the MHS rather than the final unalterable list.

Recommendations

This was a limited pilot study that included input from only six respondents, and while the results appear to be valid compared to another independent study, the conclusions developed from this data need to be validated comprehensively throughout the Army MHS. The Army pharmacy community should begin a discussion of this issue to validate and add to the findings of this study. The critical clinical tasks identified from this study should be validated by a larger sample of stakeholders with the final product evaluated in a process similar to that described by Rough et.al. This process included the following four steps: (1) establish the minimum standards for CPS activities required for every patient; (2) establish a time standard for completion of these activities via time-motion or work sampling studies; (3) establish an effective weighting system for competing interventions; and, (4) establish a volume indicator that signals the initiation of the CPS process that is automatically captured. With these elements in place, determining workload is completed by multiplying the time standard by the quantity of volume indicators, and this information can generate staffing requirements estimates for personnel justification.[7]

Implications for Future Research

Accordingly, finalizing the list of CPS activities becomes step one. For step two, the MHS should complete time motion studies of each included activity to develop a realistic timeframe for a clinical pharmacist to complete each included activity. Step three would require the establishment of a weighting method to account for the acuity or intensity of the services provided. The SHPA utilized the hospital service or bed type (e.g., critical care, general medicine, etc.) as an indicator of patient acuity, but the MHS

will have to decide on the appropriateness of this system. Finally, in step four the MHS would have to settle on a volume indicator that accurately projects staffing needs such as average daily census. With these elements in place forecasting work load requires an administrator to simply multiply the time standard by the quantity of volume indicators.

Obviously, to bring this process to fruition will require substantial research efforts, but this study only examines appropriate inputs to forecast staffing. Inevitably it will be important to develop effective ways to illustrate a return on investment for these activities. Based on the literature review and panel discussion this study stipulated that the provision of CPS produces significant returns on investment both fiscally and in patient outcomes; however, historic data notwithstanding, hospital administrators will seek to ensure this allocation of resources is translating into verifiable outcomes. Consequently one other area for future research will be to determine the best measures of effectiveness for CPS.

Summary

This study provided a starting point for a discussion of a current issue that is affecting both the profession of pharmacy within the MHS and in the civilian sector. The results of the Delphi interview indicate: (1) CPS in the MHS is valuable and should be provided to all inpatients; (2) current staffing levels are inadequate and the current staffing model is inappropriate; (3) workload counting for clinical activities is not practical and is inappropriate; (4) manning requirements should be determined on the basis of the clinical service provided rather than the tasks performed. The subsequent Delphi survey rounds resulted in the creation of a list of fifteen activities that should be included in the list of activities that comprise routine CPS in the MHS. These results were

discussed in terms of their reliability and generalizability along with their implications for the development of future staffing models. Opportunities for future research building on the results of this study were suggested.

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[1]Stuchbery, "Clinical Pharmacist's Activities," 11.

[2]Rough, "Effective Use of Tools Part 1," 300-301; Rough, "Effective Use of Tools Part 2," 380-88; Toohey, "Adaptation of a Workload Measurement System," 999-1004; Iglar, "Time and Cost Requirements," 572-78.

[3]Rough, "Effective Use of Tools Part 2," 380-88.

[4]Society of Hospital Pharmacists Association Committee of Specialty Practice in Clinical Pharmacy, "SHPA Standards of Practice For Clinical Pharmacy (Supplement)," 144-45.

[5]Muhammad I. Yousuf, "Using Experts' Opinions through Delphi Technique," *Practical Assessment, Research and Evaluation* 12, no. 4 (May 2007): 1-8, http://pareonline.net/pdf/v12n4.pdf (accessed February 19, 2012), 3.

[6]Ibid., 5.

[7]Rough, "Effective Use of Tools Part 2," 380-88; Society of Hospital Pharmacists Association Committee of Specialty Practice in Clinical Pharmacy, "SHPA Standards of Practice For Clinical Pharmacy (Supplement)," 144-45.

GLOSSARY

Adverse Drug Reactions. The patient has a medical problem that is the result of an ADR or adverse effect.[1]

Adverse Drug Reaction Management. Prevention, detection, assessment, management, and documentation of adverse drug reactions.[2]

Assessment of Medication Management. Review of all medicine orders to ensure safe and appropriate dosage administration and to optimize medicine therapy and patient outcomes.[3]

Automated Staffing Assessment Model. The Army Medical Command's Manpower HQDA-approved manpower requirements determination process.[4]

Clinical Pharmacy. A health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, wellness, and disease prevention.[5]

Clinical Review. Assessment of the patient and other parameters for the purpose of evaluating the response to medicine therapy and management.[6]

Decision to Prescribe a Medicine. Provide guidance and recommendations in the form of information and expertise to contribute to optimal medication selections.[7]

Drug Interactions. The patient has a medical problem that is the result of a drug-drug, drug-food, or drug-laboratory interaction.[8]

Drug Use Without Indication. The patient is taking a drug for no medically valid indication.[9]

Failure to Receive Drugs. The patient has a medical problem that is the result of his or her not receiving a drug (e.g., for pharmaceutical, psychological, sociological, or economic reasons).[10]

Improper Drug Selection. The patient has a drug indication but is taking the wrong drug.[11]

Information for Ongoing Care. Communication with health professionals (community pharmacists, general practitioners, hospital pharmacists from different institutions, other healthcare providers) to facilitate seamless transition between healthcare providers.[12]

Medication History. An interview with the patient/care-giver, reviewing documentation such as previous medicine orders, referral letters, admission notes, and patient medicine lists.[13]

Medication Reconciliation. The process of comparing a patient's medication orders to all of the medications that the patient has been taking. This reconciliation is done to avoid medication errors such as omissions, duplications, dosing errors, or drug interactions. It should be done at every transition of care in which new medications are ordered or existing orders are rewritten.[14]

Overdosage. The patient has a medical problem that is being treated with too much of the correct drug.[15]

Participation in Rounds. Attendance and participation at multidisciplinary ward rounds or meetings.[16]

Pharmaceutical (Pharmacy) Care. The responsible provision of drug therapy for the purpose of achieving definite outcomes that improve a patient's quality of life. These outcomes are (1) cure of a disease; (2) elimination or reduction of a patient's symptomatology; (3) arresting or slowing of a disease process; or (4) preventing a disease or symptomatology.[17]

Pharmacokinetic monitoring. The process of applying pharmacokinetic principles, absorption, distribution, metabolism, and excretion of drugs, to determine the dosage regimens of specific drug products for specific patients to maximize pharmacotherapeutic effects and minimize toxic effects.[18]

Provision of Drug Information to Health Professionals. Provision of medicine information to health professionals relating to a patient's therapy for the purpose of influencing the prescribing, administration, monitoring, and use of medicines.[19]

Provision of Drug Information to Patients. Providing comprehensive information and advice to patients/care-givers to encourage safe and appropriate medicine use.[20]

Subtherapeutic Dosage. The patient has a medical problem that is being treated with too little of the correct drug.[21]

Therapeutic Drug Monitoring. Interpretation, monitoring, and communication of measured drug concentrations in body fluids to optimize drug efficacy and minimize toxicity.[22]

Untreated Indication. The patient has a medical problem that required drug therapy but is not receiving a drug.[23]

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[1]Hepler, "Opportunities and Responsibilities," 536.

[2]Society of Hospital Pharmacists Association Committee of Specialty Practice in Clinical Pharmacy, "SHPA Standards of Practice for Clinical Pharmacy," 131.

[3]Society of Hospital Pharmacists Association, "SHPA Standards of Practice for Clinical Pharmacy," 131.

[4]Southern Regional Medical Command, "Manpower and Management," http://www.srmc.amedd.army.mil/assets/home/manpower.aspx (accessed October 8, 2011).

[5]American College of Clinical Pharmacy, "The Definition of Clinical Pharmacy," Pharmacotherapy 2008 28, no. 6 (June 2008): 816-17.

[6]Society of Hospital Pharmacists Association, "SHPA Standards of Practice for Clinical Pharmacy," 131.

[7]Ibid.

[8]Hepler, "Opportunities and Responsibilities," 536.

[9]Ibid.

[10]Ibid.

[11]Ibid., 535.

[12]Society of Hospital Pharmacists Association, "SHPA Standards of Practice for Clinical Pharmacy," 131.

[13]Ibid.

[14]The Joint Commission, "Using Medication Reconciliation to Prevent Errors," *Sentinel Event Alerts*, January 25, 2006, http://www.jointcommission.org/assets/1/18/SEA_35.pdf (accessed October 8, 2011).

[15]Hepler, Opportunities and Responsibilities, 535-536.

[16]Society of Hospital Pharmacists Association, "SHPA Standards of Practice for Clinical Pharmacy," 131.

[17]Hepler, Opportunities and Responsibilities, 539.

[18]American Society of Health-System Pharmacists, "ASHP statement on the Pharmacist's Role in Clinical Pharmacokinetic Monitoring," *American Journal of Health-System Pharmacy* 55 (1998): 1726-7.

[19]Society of Hospital Pharmacists Association, "SHPA Standards of Practice for Clinical Pharmacy," 122-46.

[20]Ibid.

[21]Hepler, “Opportunities and Responsibilities,” 535.

[22]Society of Hospital Pharmacists Association, “SHPA Standards of Practice for Clinical Pharmacy,” 131.

[23]Hepler, “Opportunities and Responsibilities,” 535.

APPENDIX A

Pharmacy Practice Activity Classification Applicable to Clinical Pharmacy Services

Pharmacy Practice Activity Classification Applicable to CPS		
Key	**Category**	**Description**
A	Domain	Ensuring appropriate therapy and outcomes
A.1	Class	Ensuring appropriate pharmacotherapy
A.1.1	Activity	Establish relationship with patient
A.1.1.1	Task	Introduce self to patient and explain services
A.1.1.2	Task	Determine patient's primary spoken language and communications ability/limitations
A.1.1.3	Task	Determine patient's educational level
A.1.2	Activity	Obtain information to create and maintain confidential patient record
A.1.2.1	Task	Obtain diagnostic patient information
A.1.2.2	Task	Obtain laboratory information
A.1.2.3	Task	Obtain physical assessment information
A.1.2.4	Task	Create a complete medication record
A.1.3	Activity	Assess patient information
A.1.3.1	Task	Assess objective and subjective data
A.1.3.2	Task	Identify potential or actual drug therapy problems
A.1.3.3	Task	Perform patient triage and initiate referral(s)
A.1.4	Activity	Formulate treatment plan
A.1.4.1	Task	Define treatment goals
A.1.4.2	Task	Assess therapy alternatives
A.1.4.3	Task	Establish an appropriate regimen
A.1.4.4	Task	Establish an outcomes monitoring plan
A.1.5	Activity	Document activities
A.1.5.1	Task	Update the patient record
A.1.5.2	Task	Communicate the treatment plan to other providers
A.2	Class	Ensuring patient's understanding and adherence to his or her treatment plan
A.2.1	Activity	Interview patient
A.2.1.1	Task	Assess the patient's knowledge and capability for understanding/communicating
A.2.1.2	Task	Discuss the treatment plan
A.2.1.3	Task	Educate patient/family/caregiver
A.2.1.4	Task	Verify patient understanding and knowledge of the treatment plan
A.2.2	Activity	Develop an adherence assistance plan

Key	Category	Description
A.2.2.1	Task	Determine with the patient potential problems in adhering to the treatment plan
A.2.2.2	Task	Help the patient generate solutions to potential problems
A.2.2.3	Task	Provide tools to enhance adherence to the treatment plan
A.2.2.4	Task	Enlist family/caregiver assistance when necessary
A.2.3	Activity	Document the patient interview, evaluation, treatment plan, educational/counseling sessions, and adherence assistance plan
A.3	Class	Monitoring and reporting outcomes
A.3.1	Activity	Monitor plan implementation
A.3.1.1	Task	Initiate monitoring activities
A.3.1.2	Task	Review/establish monitoring measures
A.3.2	Activity	Gather patient information
A.3.2.1	Task	Obtain subjective information
A.3.2.2	Task	Obtain objective information
A.3.3	Activity	Perform patient assessment
A.3.3.1	Task	Assess subjective/objective data
A.3.4	Activity	Assess and modify the plan
A.3.4.1	Task	Assess the plan against new data
A.3.4.2	Task	Recommend treatment plan continuation
A.3.4.3	Task	Modify the treatment plan
A.3.4.4	Task	Educate the patient
A.3.4.5	Task	Complete documentation and billing activities
D	Domain	Health systems management
D.3	Class	Managing the use of medications within the health system
D.3.1	Activity	Implement drug utilization management
D.3.1.1	Task	Develop and maintain the formulary/preferred drug list
D.3.1.2	Task	Conduct drug utilization review
D.3.1.3	Task	Perform medication use evaluation
D.3.1.4	Task	Design/produce utilization reports
D.3.1.5	Task	Implement programs to improve patterns of utilization
D.3.1.6	Task	Measure the impact of program improvements and monitoring systems
D.3.2	Activity	Design and implement disease and drug therapy management programs
D.3.2.1	Task	Establish, participate in and monitor disease state management programs
D.3.2.2	Task	Establish, participate in and monitor clinical practice guidelines/critical pathways

Key	Category	Description
D.3.2.3	Task	Develop/monitor prior authorization procedures
D.3.3	Activity	Participate in quality assessment/improvement activities
D.3.3.1	Task	Identify, assess and report adverse drug reactions/drug product problems
D.3.3.2	Task	Identify, assess and report medication errors
D.3.3.3	Task	Conduct, document and report clinical consultations/interventions
D.3.3.4	Task	Provide and document drug information services
D.3.3.5	Task	Establish screening protocols and conduct regular monitoring
D.3.3.6	Task	Provide educational programs to health system personnel on medication use
D.4.7	Activity	Publish research finding and other scholarly information
D.4.8	Activity	Present research findings in local, regional and national forums
D.5	Class	Engaging in Interdisciplinary Collaboration
D.5.1	Activity	Provide education for health professionals
D.5.1.1	Task	Present continuing education programs
D.5.1.2	Task	Publish reviews of up-to-date drug therapy
D.5.1.3	Task	Precept pharmacy students/residents
D.5.1.4	Task	Conduct inservice training
D.5.2	Activity	Participate in health system committees and teams
D.5.2.01	Task	Serve on the pharmacy and therapeutics committee
D.5.2.02	Task	Serve on the infection control committee
D.5.2.03	Task	Serve on the quality assessment and assurance committee or continuous quality improvement committee
D.5.2.04	Task	Serve on the care plan team
D.5.2.05	Task	Participate on the behavior management team
D.5.2.06	Task	Work on preparing the health system for licensure/accreditation surveys
D.5.2.07	Task	Serve on the code blue team
D.5.2.08	Task	Serve on the community healthcare management board
D.5.2.09	Task	Serve on the utilization management team
D.5.2.10	Task	Serve on the institutional review board
D.5.2.11	Task	Serve on other healthcare committees and boards

APPENDIX B

Delphi Panelist Consent Form

CONSENT AND USE AGREEMENT FOR INTERVIEW MATERIALS

You have the right to choose whether or not you will participate in this interview, and once you begin you may cease participating at any time without penalty. No questions will be asked about nor should you offer any classified information during this interview. The anticipated risk to you in participating is negligible and no direct personal benefit has been offered for your participation. If you have questions about this research study, please contact the student at: (469)337-7666 or Dr. Robert F. Baumann, Director of Graduate Degree Programs, at (913)-684-2742.

To: Director, Graduate Degree Programs
Room 4508, Lewis & Clark Center
U.S. Army Command and General Staff College

1. I, _____, participated in an oral interview conducted by **MAJ**

CHRISTOPHER ELLISON, a graduate student in the Master of Military Art and Science Degree

Program, on the following date [s]: _____ concerning the following topic: **Clinical**

Pharmacy Activities and Clinical Pharmacist Staffing.

2. I understand that the recording[s] and any transcript resulting from this interview will belong to the U.S. Government to be used in any manner deemed in the best interests of the Command and General Staff College or the U.S. Army, in accordance with guidelines posted by the Director, Graduate Degree Programs and the Center for Military History. I also understand that subject to security classification restrictions I will be provided with a copy of the recording for my professional records. In addition, prior to the publication of any complete edited transcript of this interview, I will be afforded an opportunity to verify its accuracy.

3. I hereby expressly and voluntarily relinquish all rights and interest in the recording [s] with the following caveat:

_____ None _____ Other: _____
_____

I understand that my participation in this interview is voluntary and I may stop participating at any time without explanation or penalty. I understand that the tapes and transcripts resulting from this interview may be subject to the Freedom of Information Act, and therefore, may be releasable to the public contrary to my wishes. I further understand that, within the limits of the law, the U.S. Army will attempt to honor the restrictions I have requested to be placed on these materials.

_____
Name of Interviewee Signature Date

_____
Accepted on Behalf of the Army by Date

APPENDIX C

Delphi Round 1 Semi-Structured Interview Questionnaire

With your permission, I will be recording this interview for the purposes of transcription. Do I have your permission to record?

1. What is your highest level of education (BS Pharm, Pharm.D., Residency, Fellowship)?

2. Do you have any additional training besides Pharm.D.?

3. How long have you been actively practicing pharmacy?

4. Practicing in the Military Health System?

5. How many years have you served as a pharmacy chief?

6. How many years have you served as a clinical director?

7. How much time have you had with clinical pharmacy in the MHS?

8. How many years have you served as a residency director?

9. How many years have you served as a Inpatient supervisor?

10. A wealth of clinical literature indicates that the provision of clinical pharmacy services (CPS) to inpatients is valuable in terms of economic benefits and patient outcomes; however, there is relatively little literature available that deals specifically with CPS in the Military Health System (MHS). What are your impressions of the value of CPS for MHS inpatients?

11. The current American Society of Health-System Pharmacy Practice Initiative has set a goal of providing CPS to every inpatient. Do you think the MHS should provide CPS to every inpatient regardless of the reason for admission?

12. Do you think MHS Pharmacies are sufficiently staffed to provide CPS to all inpatients?

13. Is this an attainable goal?

14. Do you have experience with the Automated Staffing Assessment Model?

15. Do you feel it is adequate to determine the level of clinical pharmacists for your facility?

16. What are some methods you have used to justify additional inpatient Clinical Pharmacy staffing at your hospital?

17. A lot of our staffing models are based on our distributive functions, and that is not unique to the military and it is really difficult to measure a lot of things we do in clinical pharmacy. How successful are available data capture systems that you have used for clinical pharmacy (Clini-trend and Quantifi)?

18. Identifying a universal list of clinical pharmacy service (CPS) activities for clinical pharmacists to perform on all inpatients within the Military Health System is the critical first step to developing an accurate military health system staffing model for clinical pharmacists. What routine activities (i.e. activities that should be performed for all inpatients) do you think should be included in the military health system's definition of clinical pharmacy service?

APPENDIX D

Delphi Likert Surveys

Delphi Round 2 – Survey 1

ROUND 2 Instructions
Please review each activity below and consider the following question:
Should this activity be included on the Military Health System definition of routine clinical pharmacy services for inpatients?

Then use the drop down arrows to score the activity using the following scale:
4. Definitely should be included
3. Should probably be included
2. Should probably NOT be included
1. Definitely should NOT be included

	ACTIVITY	Frequency Distribution (The percentage of respondents who included this in their original list)	Response
1	Admission medication history/interview	100% (6/6)	
2	Drug therapy monitoring	100% (6/6)	
3	Pharmacokinetics	83% (5/6)	
4	Medication reconciliation	83% (5/6)	
5	Discharge counseling	83% (5/6)	
6	Drug selection	83% (5/6)	
7	Laboratory value monitoring/ordering	67% (4/6)	
8	Provider encounters/education	67% (4/6)	
9	Rounding	67% (4/6)	
10	Patient education	50% (3/6)	
11	Dosing adjustments	50% (3/6)	
12	Multidisciplinary team member - Developing plan	50% (3/6)	
13	Adverse drug reaction management	33% (2/6)	
14	Intravenous to 'by mouth' (IV/PO) conversion	33% (2/6)	
15	Prospective order review	33% (2/6)	
16	Interaction monitoring/prevention	33% (2/6)	
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	33% (2/6)	
18	Drug information	33% (2/6)	
19	Hyperalimentation/Parenteral nutrition review	17% (1/6)	
20	Monitoring safety	17% (1/6)	
21	Graduate Medical/Pharmacy Education support	17% (1/6)	
22	Therapeutic substitution	17% (1/6)	
23	Compliance with CMS core measures	17% (1/6)	
24	Protocol execution (ex. Anticoagulation monitoring)	17% (1/6)	

Please provide any additional comments:

Rounds 3 and 4 – Surveys 2 and 3

ROUND 3 Instructions
Your previous score is displayed for each activity along with the median and mode score from the group for each activity.
Please review each activity below and associated group data and **reconsider** the following question:
Should this activity be included on the Military Health System definition of routine clinical pharmacy services for inpatients?

Then use the drop down arrows to score the activity using the following scale:
4. Definitely should be included
3. Should probably be included
2. Should probably NOT be included

	ACTIVITY	Group Score Mode	Group Score Median	Your Last Score	Response
1	Admission medication history/interview	4	4	4	
2	Drug therapy monitoring	4	4	4	
3	Pharmacokinetics	4	4	4	
4	Medication reconciliation	4	4	4	
5	Discharge counseling	4	4	4	
6	Drug selection	4	4	4	
7	Laboratory value monitoring/ordering	4	4	4	
8	Provider encounters/education	4	4	3	
9	Rounding	3	3	3	
10	Patient education	4	4	4	
11	Dosing adjustments	4	4	3	
12	Multidisciplinary team member - Developing plan	3	3	3	
13	Adverse drug reaction management	3	3	3	
14	Intravenous to 'by mouth' (IV/PO) conversion	4	4	3	
15	Prospective order review	4	4	3	
16	Interaction monitoring/prevention	4	3.5	4	
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	3	3	4	
18	Drug information	4	4	4	
19	Hyperalimentation/Parenteral nutrition review	3	3	2	
20	Monitoring safety	3	3	2	
21	Graduate Medical/Pharmacy Education support	4	3.5	3	
22	Therapeutic substitution	3	3	3	
23	Compliance with CMS core measures	3	3	2	
24	Protocol execution (ex. Anticoagulation monitoring)	3	3	3	

Please provide any additional comments:

APPENDIX E

Interview Thematic Analysis

Significant statements	Theme
o [CPS is] equally as valuable as what has been proven in the civilian workspace. As you know, there is really no difference in our practice to any large extent…it is all the same. o It's kind of a global picture...I think it has already been proven in several studies that [with CPS] you don't always same money, but you certainly can save outcomes in terms of reducing length of stay. o I would say that in my experience those values described in the literature [for CPS] translate into the military health system as well. o You could generalize what is done in the civilian literature would translate equally well to the MHS just based on the supervision that I have of those CPS being provided here at my institution. o They [CPS] are just as valuable as they are in the civilian practice. o In general the impact of clinical outcomes [due to CPS] should be just as great [in the MHS] as in civilian practice. o I don't see any difference in terms of the value [of CPS] based on the different settings. The data that is presented for a civilian setting would equally applicable in a military setting. To a lesser extent we do the same things in the military.	CPS provided in the MHS is likely to share the same level of value proven in multiple studies of civilian CPS.
o I think the value is in improved outcomes. o I think in terms of patient outcomes, I think it is really critical that you have those services. o I see that our pharmacists are reducing overall lengths of stay, they are influencing prescribing habits. o In general the impact of clinical outcomes should be just as great [in the MHS] as in civilian practice.	CPS Improves patient outcomes.
o I think unfortunately, that [providing CPS to every inpatient] is a laudable goal, and I think everybody should use the tools that are available through ASHP especially the gap analysis…the self assessment you complete up front. o Yes, I do [think the MHS should provide CPS to every inpatient]. Obviously, it comes to different degrees. o Yes, definitely [the MHS should provide CPS to every inpatient]. o Yes, that should be the goal [think the MHS should provide CPS to every inpatient]. o My gut reaction is yes [the MHS should provide CPS to every inpatient].	The MHS should make providing CPS to all inpatients a goal.

Significant statements	Theme
o Unfortunately, pharmacists are a finite resource and because your resources are limited; especially clinical pharmacists for the inpatient care areas, I think you need to dedicate those resources to the patients where they would have the greatest impact. o My answer is yes, but to different degrees. o I think there is a need to have pharmacist eyes on every patient; some patients depending on their medical condition, their reason for admission, or other relevant history warrant more detailed involvement by pharmacy. o I don't think every patient needs the same level of clinical services, but everybody should have something. o You'd have to prioritize the service you provide based on the patients with the highest need. o It may just be a one-time encounter; it may last for half an hour or less, or with other patients, you may have to meet with them every day to do follow-up on drug therapy and monitor for any adverse effects, and make sure they are having some positive benefits from the drugs. o Based on [resource constraints], you'd have to tier services based on your highest risk. o In an ideal world, I'd say yes, but with constraints we will have to risk stratify individuals to determine where we want to assign resources.	CPS should be prioritized based on the needs of the patient.
o My own experience is that most MTFs according to the ASAM model do not have sufficient clinical staff identified to assume the more advanced practice roles o Mostly, inadequate[ly] staff[ed] to provide a depth of [CPS] service consistently. o No, our manning models are not built around that [providing CPS to all inpatients] right now. ASAM doesn't really reflect those requirements. o No, we are not [sufficiently staffed to provide CPS to all inpatients]. o I think at the FTE level it can always get better. o No, not even close [to sufficiently staffed to provide CPS to all inpatients]. o Absolutely not, [ASAM] is very poor at identifying the clinical staffing requirements. o No that [ASAM] is not a feasible staffing model. o The [ASAM] model really doesn't reflect manning needs.	MHS Pharmacies are not adequately staffed to provide CPS to all patients, and the ASAM model does not accurately forecast staffing needs for this goal.

Significant statements	Theme
o We have pharmacists that are considered staff pharmacists who are assigned to a care area and round with the hospitalist teams that are seeing patients in that area and who are responsible for order entry for the patients they are assigned. So they are assuming a greater clinical role. o Also, I think we will rely more on automated dispensing technology and technicians to accomplish the preparation, distribution, and perhaps even initial evaluation of the order with pharmacist verification and oversight to allow pharmacists to be more involved in activities that require their cognitive skills. o If there were more techs to do that administrative work, then the pharmacists might be available to do more clinical work. o We might be able to show that you wouldn't need quite as many pharmacists to provide that care across our patient care areas. o We spend a lot of time in medication management activities and unfortunately the skill sets that are being used in the inpatient arena by nurses and medics in order to manage the medication is less efficient than utilizing pharmacy technicians for that purpose. o I think that if we used technicians for a lot of these [administrative] tasks, it would free up my pharmacists' time to get more involved in direct patient care activities and dedicated team support. o Pharmacists have to be familiar with the distributive process, so they have realistic expectations of what the staff is doing, but we do need to minimize the amount of time they spend in distributive activities so that they can capitalize on their clinical skills. o It would require some retraining for those that had been in a strictly centralized type position in the inpatient pharmacy in order to develop the communication skills and knowledge needed to become a decentralized and team based approach pharmacist. o The guys down in centralized pharmacy, we do have some education provided to start increasing their skills, but I don't think it is to the level they would have to have to become fully clinically integrated. o I think the average staff pharmacist without any additional training beyond their Pharm.D. . . . I think they can perform a majority of those functions. Things like IV to PO conversion, renal dose adjustments, therapeutic substitutions; possibly pharmacokinetic monitoring and those sorts of issues are doable.	Roles for pharmacists and technicians will require alteration to allow for provision of CPS to all inpatients.

Significant statements	Theme
o They [clinical data capture systems] have been really not practical. o Also, it is a question of how easy the program is to use. With these programs, you have to go into a completely different system to enter any data. o You don't want to have to go into another program to enter data because people will have varying levels of consistency with it. o People didn't really like doing the extra work involved in trying to document what they do. o It is basically data based and you had to add your encounter to it at some point…it is not a high priority for the staff because they are too busy doing distributive functions or seeing patients. o You are relying on the staff to report what they did. o The problem is we don't document everything as well probably, and don't do the research that would show that benefit. o We've tried a variety of programs, but right now, we are not doing a good job [of capturing workload data]. o The problem is that many of the systems are cumbersome and require extensive documentation of every activity. A pharmacist on the go trying to fulfill multiple patient care support requirements doesn't have a lot of time to sit there and complete. o The pharmacists indicated they did not have the time it required to input their activities…it became cumbersome. o From the chief's perspective, I would rather have the pharmacists do the clinical work than worrying about whether they are going to get the tick marks down. o They are worthless because it is a self-reporting mechanism for the pharmacists that do this. Since it is a self-reporting system, I can make it up as I go along if that is what I need to do to meet my supervisor's goals that they set. I have seen this happen in the civilian sector. o There is no ability for those systems to evaluate or to quantify the effect of an intervention that may have a life to it. . . . [They] may have unquantifiable effects on the members of the team in terms of practice changes just due to those five minutes. o Any dollar savings that these systems try to apply to any of the interventions is really "funny money." There is really no scientific objective data behind the dollars that are assigned to a specific intervention. o I don't find any of this valuable…speaking from two years of having my own clinical specialists doing this recording. We recorded hundreds of thousands of interventions in those two years, and I can't say that I found any of that data to be useful. o Counting the widgets is down in the weeds too far and doesn't really reflect what the impact of this is. Those clinical studies that have looked at a critical care pharmacist being on rounds versus not being on rounds and the impact that it had on the outcomes.	Workload counting for CPS is impractical and does not accurately assess the impact of interventions.

APPENDIX F

Survey Results

Survey Raw Response Data By Round

ACTIVITY	Activity Description	Expert 1	Expert 1	Expert 1
		Round 1	Round 2	Round 3
1	Admission medication history/interview	4	4	4
2	Drug therapy monitoring	4	4	4
3	Pharmacokinetics	4	3	3
4	Medication reconciliation	4	4	4
5	Discharge counseling	4	4	4
6	Drug selection	4	4	4
7	Laboratory value monitoring/ordering	4	4	4
8	Provider encounters/education	3	3	3
9	Rounding	3	3	3
10	Patient education	4	4	4
11	Dosing adjustments	3	3	4
12	Multidisciplinary team member - Developing plan	3	3	3
13	Adverse drug reaction management	3	3	3
14	Intravenous to 'by mouth' (IV/PO) conversion	3	3	3
15	Prospective order review	3	4	4
16	Interaction monitoring/prevention	4	4	4
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	4	3	3
18	Drug information	4	4	4
19	Hyperalimentation/Parenteral nutrition review	2	2	3
20	Monitoring safety	2	2	3
21	Graduate Medical/Pharmacy Education support	3	3	3
22	Therapeutic substitution	3	3	3
23	Compliance with CMS core measures	2	2	2
24	Protocol execution (ex. Anticoagulation monitoring)	3	3	3
ACTIVITY	Activity Description	Expert 2	Expert 2	Expert 2
		Round 1	Round 2	Round 3
1	Admission medication history/interview	4	4	4
2	Drug therapy monitoring	4	4	4
3	Pharmacokinetics	4	4	4
4	Medication reconciliation	4	4	4
5	Discharge counseling	4	4	4
6	Drug selection	4	4	4
7	Laboratory value monitoring/ordering	4	4	4
8	Provider encounters/education	4	4	4
9	Rounding	3	3	3
10	Patient education	4	4	4
11	Dosing adjustments	4	4	4
12	Multidisciplinary team member - Developing plan	4	4	4
13	Adverse drug reaction management	3	3	3
14	Intravenous to 'by mouth' (IV/PO) conversion	4	4	4
15	Prospective order review	3	4	4
16	Interaction monitoring/prevention	3	4	4
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	4	4	3
18	Drug information	3	4	4
19	Hyperalimentation/Parenteral nutrition review	3	3	3
20	Monitoring safety	3	3	3
21	Graduate Medical/Pharmacy Education support	3	4	4
22	Therapeutic substitution	3	3	3
23	Compliance with CMS core measures	3	3	3
24	Protocol execution (ex. Anticoagulation monitoring)	3	3	3

ACTIVITY	Activity Description	Expert 3	Expert 3	Expert 3
		Round 1	Round 2	Round 3
1	Admission medication history/interview	4	4	4
2	Drug therapy monitoring	4	4	4
3	Pharmacokinetics	3	4	4
4	Medication reconciliation	4	4	4
5	Discharge counseling	3	3	4
6	Drug selection	3	4	4
7	Laboratory value monitoring/ordering	3	3	4
8	Provider encounters/education	4	4	4
9	Rounding	4	4	4
10	Patient education	3	4	4
11	Dosing adjustments	4	4	4
12	Multidisciplinary team member - Developing plan	3	3	3
13	Adverse drug reaction management	3	3	3
14	Intravenous to 'by mouth' (IV/PO) conversion	3	4	4
15	Prospective order review	4	4	4
16	Interaction monitoring/prevention	3	4	4
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	3	3	3
18	Drug information	4	4	4
19	Hyperalimentation/Parenteral nutrition review	3	3	3
20	Monitoring safety	2	3	3
21	Graduate Medical/Pharmacy Education support	4	4	4
22	Therapeutic substitution	3	3	3
23	Compliance with CMS core measures	3	3	3
24	Protocol execution (ex. Anticoagulation monitoring)	4	4	4
ACTIVITY	Activity Description	Expert 4	Expert 4	Expert 4
		Round 1	Round 2	Round 3
1	Admission medication history/interview	4	4	4
2	Drug therapy monitoring	4	4	4
3	Pharmacokinetics	4	4	4
4	Medication reconciliation	4	4	4
5	Discharge counseling	4	4	4
6	Drug selection	4	4	4
7	Laboratory value monitoring/ordering	4	4	4
8	Provider encounters/education	4	4	4
9	Rounding	3	3	3
10	Patient education	4	4	4
11	Dosing adjustments	4	4	4
12	Multidisciplinary team member - Developing plan	3	3	3
13	Adverse drug reaction management	4	3	3
14	Intravenous to 'by mouth' (IV/PO) conversion	4	4	4
15	Prospective order review	4	4	4
16	Interaction monitoring/prevention	4	4	4
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	3	3	3
18	Drug information	4	4	4
19	Hyperalimentation/Parenteral nutrition review	3	3	3
20	Monitoring safety	3	3	3
21	Graduate Medical/Pharmacy Education support	4	4	4
22	Therapeutic substitution	4	3	3
23	Compliance with CMS core measures	2	3	3
24	Protocol execution (ex. Anticoagulation monitoring)	3	3	3

ACTIVITY	Activity Description	Expert 5	Expert 5	Expert 5
		Round 1	Round 2	Round 3
1	Admission medication history/interview	3	3	3
2	Drug therapy monitoring	4	4	4
3	Pharmacokinetics	4	4	4
4	Medication reconciliation	3	3	3
5	Discharge counseling	3	3	3
6	Drug selection	4	4	4
7	Laboratory value monitoring/ordering	4	4	4
8	Provider encounters/education	4	4	4
9	Rounding	4	4	4
10	Patient education	3	3	3
11	Dosing adjustments	4	4	4
12	Multidisciplinary team member - Developing plan	4	4	4
13	Adverse drug reaction management	4	4	4
14	Intravenous to 'by mouth' (IV/PO) conversion	4	4	4
15	Prospective order review	4	4	4
16	Interaction monitoring/prevention	4	4	4
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	3	3	3
18	Drug information	4	4	4
19	Hyperalimentation/Parenteral nutrition review	4	4	4
20	Monitoring safety	3	3	3
21	Graduate Medical/Pharmacy Education support	4	4	4
22	Therapeutic substitution	4	4	4
23	Compliance with CMS core measures	4	4	4
24	Protocol execution (ex. Anticoagulation monitoring)	4	4	4
ACTIVITY	Activity Description	Expert 6	Expert 6	Expert 6
		Round 1	Round 2	Round 3
1	Admission medication history/interview	4	4	4
2	Drug therapy monitoring	3	4	4
3	Pharmacokinetics	3	3	3
4	Medication reconciliation	4	4	4
5	Discharge counseling	4	4	4
6	Drug selection	2	3	3
7	Laboratory value monitoring/ordering	4	4	4
8	Provider encounters/education	3	3	4
9	Rounding	1	2	3
10	Patient education	4	4	4
11	Dosing adjustments	3	3	3
12	Multidisciplinary team member - Developing plan	2	2	3
13	Adverse drug reaction management	1	2	3
14	Intravenous to 'by mouth' (IV/PO) conversion	4	4	4
15	Prospective order review	4	4	4
16	Interaction monitoring/prevention	3	3	4
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	1	2	3
18	Drug information	4	4	4
19	Hyperalimentation/Parenteral nutrition review	3	3	3
20	Monitoring safety	4	4	4
21	Graduate Medical/Pharmacy Education support	1	2	4
22	Therapeutic substitution	3	3	3
23	Compliance with CMS core measures	3	3	3
24	Protocol execution (ex. Anticoagulation monitoring)	3	3	3

Survey Central Tendency Data

ACTIVITY	Activity Description	Round 1		Round 2		Round 3	
		Mode	Median	Mode	Median	Mode	Median
1	Admission medication history/interview	4.00	4.00	4.00	4.00	4.00	4.00
2	Drug therapy monitoring	4.00	4.00	4.00	4.00	4.00	4.00
3	Pharmacokinetics	4.00	4.00	4.00	4.00	4.00	4.00
4	Medication reconciliation	4.00	4.00	4.00	4.00	4.00	4.00
5	Discharge counseling	4.00	4.00	4.00	4.00	4.00	4.00
6	Drug selection	4.00	4.00	4.00	4.00	4.00	4.00
7	Laboratory value monitoring/ordering	4.00	4.00	4.00	4.00	4.00	4.00
8	Provider encounters/education	4.00	4.00	4.00	4.00	4.00	4.00
9	Rounding	3.00	3.00	3.00	3.00	3.00	3.00
10	Patient education	4.00	4.00	4.00	4.00	4.00	4.00
11	Dosing adjustments	4.00	4.00	4.00	4.00	4.00	4.00
12	Multidisciplinary team member - Developing plan	3.00	3.00	3.00	3.00	3.00	3.00
13	Adverse drug reaction management	3.00	3.00	3.00	3.00	3.00	3.00
14	Intravenous to 'by mouth' (IV/PO) conversion	4.00	4.00	4.00	4.00	4.00	4.00
15	Prospective order review	4.00	4.00	4.00	4.00	4.00	4.00
16	Interaction monitoring/prevention	4.00	3.50	4.00	4.00	4.00	4.00
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	3.00	3.00	3.00	3.00	3.00	3.00
18	Drug information	4.00	4.00	4.00	4.00	4.00	4.00
19	Hyperalimentation/Parenteral nutrition review	3.00	3.00	3.00	3.00	3.00	3.00
20	Monitoring safety	3.00	3.00	3.00	3.00	3.00	3.00
21	Graduate Medical/Pharmacy Education support	4.00	3.50	4.00	4.00	4.00	4.00
22	Therapeutic substitution	3.00	3.00	3.00	3.00	3.00	3.00
23	Compliance with CMS core measures	3.00	3.00	3.00	3.00	3.00	3.00
24	Protocol execution (ex. Anticoagulation monitoring)	3.00	3.00	3.00	3.00	3.00	3.00

Spearman Rank Correlation Analysis Data

	Activity Description	R1 to R2		R2 to R3	
		R1-R2 di2	Spearman rank Coeff	R2-R3 di2	Spearman rank Coeff
1	Admission medication history/interview	0	1.000	0	1.000
2	Drug therapy monitoring	1	0.971	0	1.000
3	Pharmacokinetics	2	0.943	0	1.000
4	Medication reconciliation	0	1.000	0	1.000
5	Discharge counseling	0	1.000	1	0.971
6	Drug selection	2	0.943	0	1.000
7	Laboratory value monitoring/ordering	0	1.000	1	0.971
8	Provider encounters/education	0	1.000	1	0.971
9	Rounding	1	0.971	1	0.971
10	Patient education	1	0.971	0	1.000
11	Dosing adjustments	0	1.000	1	0.971
12	Multidisciplinary team member - Developing plan	0	1.000	1	0.971
13	Adverse drug reaction management	2	0.943	1	0.971
14	Intravenous to 'by mouth' (IV/PO) conversion	1	0.971	0	1.000
15	Prospective order review	2	0.943	0	1.000
16	Interaction monitoring/prevention	2	0.943	1	0.971
17	Follow up/bridge to outpatient/aftercare/liaison to other pharmacy areas	2	0.943	2	0.943
18	Drug information	1	0.971	0	1.000
19	Hyperalimentation/Parenteral nutrition review	0	1.000	1	0.971
20	Monitoring safety	1	0.971	1	0.971
21	Graduate Medical/Pharmacy Education support	2	0.943	4	0.886
22	Therapeutic substitution	1	0.971	0	1.000
23	Compliance with CMS core measures	1	0.971	0	1.000
24	Protocol execution (ex. Anticoagulation monitoring)	0	1.000	0	1.000

Note: Spearman rank coefficient critical value for a sample size of 6 with an alpha level of 0.05 is 0.829.

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